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Validation of Chemical and Biological Techniques for Evaluation of Vapors in Ambient Air/Mutagenicity Testing of Twelve (12) Vapor-Phase Compounds

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VALIDATION OF CHEMICAL AND BIOLOGICAL TECHNIQUES FOR EVALUATION OF VAPORS IN AMBIENT AIR/MUTAGENICITY TESTING OF TWELVE (12) VAPOR-PHASE COMPOUNDS

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16. ABSTRACT

The overall objective of this research was to further validate Ames mutagenicity preincubation system for detection of vapors in ambient air. Parameters for detection of vapors in the Ames/Salmonella mutagenicity assay were investigated and 12 vapor-phase compounds were tested for mutagenic potential in the above validated protocol with strains TA97, TA98 and TA100, both with and without Aroclor-induced hamster and rat liver S9. The 12 vapor-phase compounds tested were: methylene chloride, formaldehyde, trichloroethylene, ethylene dichloride, epichlorohydrin, nitropropane, nitrobenzene, hydrogen sulfide, butene, propylene, acetylene, and ethylene oxide. Ethylene oxide, epichlorohydrin, ethylene dichloride and methylene chloride were mutagenic.

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FOREWORD

The many benefits of our modern, developing, industrial society are accompanied by certain hazards. Careful assessment of the relative risk of existing and new man-made environmental hazards is necessary for the establishment of sound regulatory policy. These regulations serve to enhance the quality of our environment in order to promote the public health and welfare and the productive capacity of our Nation's population.

The complexities of environmental problems originate in the deep interdependent relationships between the various physical and biological segments of man's natural and social world. Solutions to these environmental problems require an integrated program of research and development using input from a number of disciplines. The Health Effects Research Laboratory, Research Triangle Park, NC and Cincinnati, OH conducts a coordinated environmental health research program in toxicology, epidemiology and clinical studies using human volunteer subjects. Wide ranges of pollutants known or suspected to cause health problems are studied. The research focuses on air pollutants, water pollutants, toxic substances, hazardous wastes, pesticides, and non-ionizing radiation. The laboratory participates in the development and revision of air and water quality criteria and health assessment documents on pollutants for which regulatory actions are being considered. Direct support to the regulatory function of the Agency is provided in the form of expert testimony and preparation of affidavits as well as expert advice to the Administrator to assure the adequacy of environmental regulatory decisions involving the protection of the health and welfare of all U.S. inhabitants.

F.Gordon Hueter,Ph.D.
Director
Health Effects Research Laboratory

Abstract

The overall objective of this research was to further validate a Tenax® collection/Ames mutagenicity preincubation system for detection of vapors in ambient air. Recovery studies from Tenax® were performed with three vapor-phase compounds that possessed a wide range of vapor pressures (i.e., epichlorohydrin, methylene chloride and nitrobenzene). Parameters for detection of vapors in the Ames/*Salmonella* mutagenicity assay were investigated and 12 vapor-phase compounds were tested for mutagenic potential in the above validated protocol with strains TA97, TA98 and TA100, both with and without Aroclor-induced hamster and rat liver S9. The 12 vapor-phase compounds tested were: methylene chloride, formaldehyde, trichloroethylene, ethylene dichloride, epichlorohydrin, nitropropane, nitrobenzene, hydrogen sulfide, butene, propylene, acetylene, and ethylene oxide.

Results suggested that: (1) recoveries of a model vapor-phase compound from Tenax® resin ranged from 22 to 29 percent; (2) log-phase cells and the preincubation technique were the preferred methods for detection of vapor-phase mutagens; (3) the maximum linear mutagenic response was detected with 10 minutes preincubation, in full vials, with no shaking during preincubation; (4) solvent type and metabolic activation did affect mutagenic potential, and (5) ethylene oxide, epichlorohydrin, ethylene dichloride and methylene chloride were mutagenic.

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APPENDIX

Raw Toxicity and Mutagenicity Data of Twelve (12) Vapor-Phase Compounds in the Ames/_Salmonella_ Assay

1.0 Introduction

Extractable organic mixtures from ambient air particulate matter are mutagenic in the Ames/*Salmonella* mutagenicity assay. However, ambient air vapors have not been tested in the Ames/*Salmonella* assay because adequate chemical and biological techniques are not presently available for this analysis. In addition, it has been estimated that vapor-phase compounds (i.e., vapors are compounds that are gases at ambient temperature and pressure) may be 50-fold more mutagenic than ambient air particulate matter. Vapors from industrial centers and mobile and energy production sources are potential health hazards. Chemical and biological techniques must therefore be developed to evaluate the mutagenic potential of ambient air vapors. This research evaluated pure ambient air vapor-phase compounds and methods for their detection.

This project further evaluated a Tenax® collection/Ames mutagenicity preincubation system for detection of vapors in ambient air (Hughes et al., EMS, 1982). Pure vapor-phase compounds with a wide range of vapor-pressures were utilized to evaluate the adsorption/desorption characteristics of these compounds from Tenax® resin. Methods for the detection of vapor-phase mutagens in a preincubation modification of Ames/*Salmonella* mutagenicity assay were also investigated.

2.0 Materials and Methods

2.1 Biological Techniques

Salmonella typhimurium strains TA98 and TA100 were supplied by Dr. Bruce Ames, Department of Biochemistry, University of California, Berkeley, California. Stationary-phase cells were grown overnight (16 hours) with shaking at 50 RPM; log-phase cells were grown on the day of the experiment by inoculating a fresh nutrient broth culture with a heavy inoculum of fresh overnight culture (1:10 dilution) and shaking the culture for 4 hours at 50 RPM. Incubation temperatures were 37°C (± 0.5°C). Plates were incubated for 48 hours, and colonies were counted with an Artex 880 automatic cell counter, calibrated by comparison with hand-counted plates and plastic disks with known colony counts.

Solvents, liquid and gaseous compounds were of the highest quality available. The DMSO was spectrophometric grade and the ethanol was 100% absolute grade. The liquid test compounds were purchased from Fisher Scientific and the gaseous compounds were purchased from Matheson Scientific Company. Rat liver S9 was derived from male Sprague-Dawley rats and hamster liver S9 was derived from male Syrian Golden hamsters. Both rats and hamsters were induced with Aroclor 1254 at 500 mg/kg five days before sacrifice.

Preincubation vials contained (per plate): 500 µl of 5% S9 mix, 100 µl of bacteria, 100 µl of solvent with test compound, and 600 µl of overlay agar. Each vial contained the contents for three plates. Half-full vials did not contain overlay agar. Preincubation was performed at 37°C in sealed one-dram glass vials in a temperature-controlled exposure chamber that completely surrounded the glass vial (Isotemp®, Fisher

Scientific). Toxicity was determined by plating approximately 1,000 colonies on histidine-supplemented agar. A viability index was calculated by comparing the number of colonies present on a dosed plate to a solvent control plate. A viability index below 50% (where greater than 50% of the bacterial population was killed) indicated excessive toxicity. A positive mutagenic response for TA97, TA98 and TA100 was defined as at least a two-fold increase in spontaneous revertants over background at two increasing dose levels.

2.2 Chemical Techniques

The five gaseous samples (hydrogen sulfide, ethylene oxide, acetylene, 1-butene, and propylene) were prepared in solutions for bioassay testing. Ethanol was chosen as the solvent for all samples, except acetylene, because it offered excellent solubility characteristics for these gases, solution stability, ease of analysis, and has been reported to be relatively nontoxic to the *Salmonella* bacteria. The gas concentration in each sample was determined by gas chromatographic analysis.

Standards were prepared by filling an evacuated 0.5 liter gas bulb with the appropriate gas and allowing the pressure to equilibrate to 1 atmosphere. Samples were withdrawn through a septum in the bulb with a gas-tight syringe and chromatographed on a 6' chromosorb 102 packed 1/4" glass GC column by FI detection. The sample mass injected was determined from the density of the gas at STP as reported in the literature. Duplicate injections were made for each point and a response curve of at least three points was established for each species (see Figure 2.2-1).

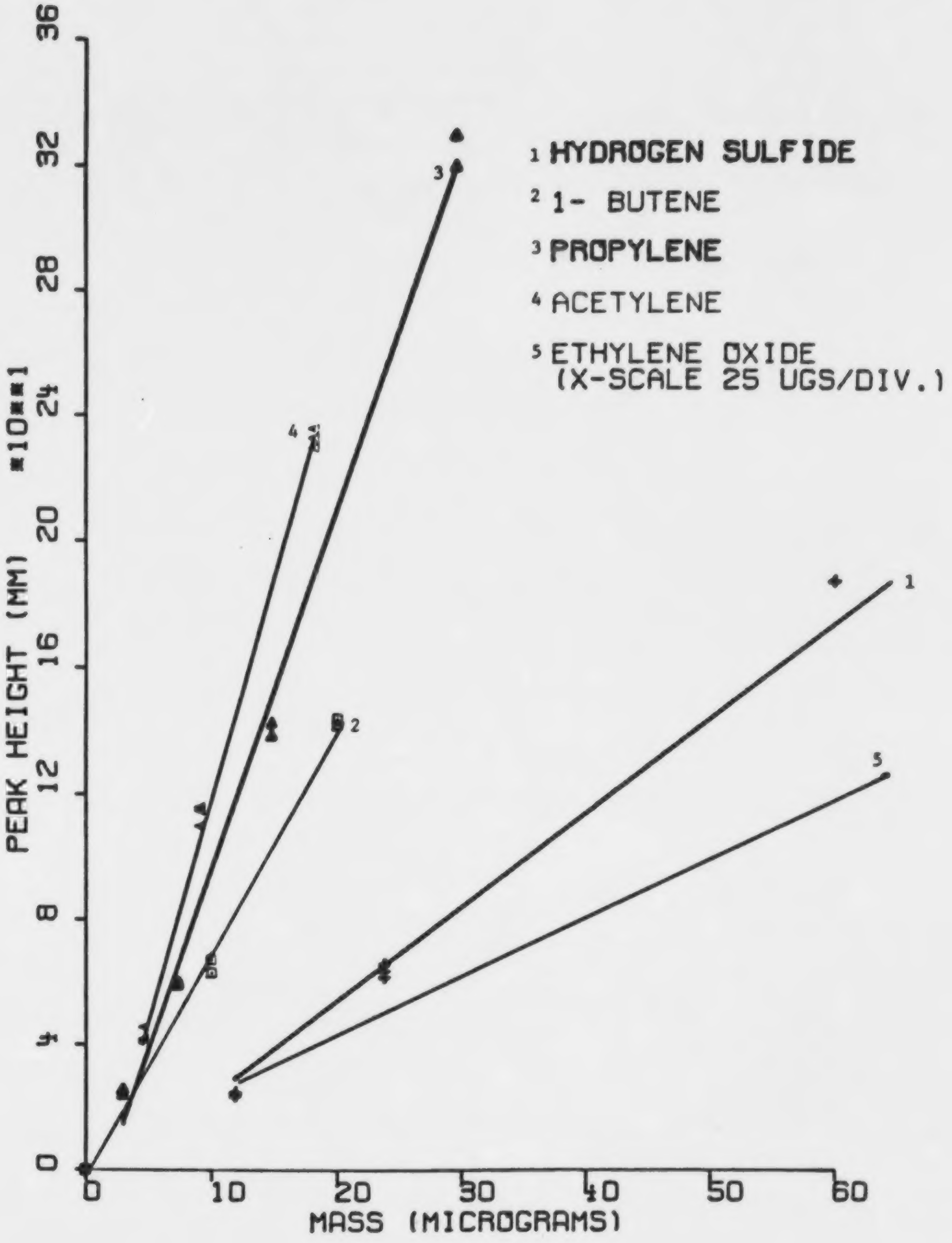

Figure 2.2-1. Response Curves for Ames Assay Vapor-Phase Samples.

CHROMATOGRAPHIC CONDITIONS

COLUMN - CHROMOSORB 102 1/4" GLASS PACKED
CARRIER - 40 ML/MIN NITROGEN
T (INJ) - 200 DEGREES CENTIGRADE
T (DET) - 200 DEGREES CENTIGRADE

HYDROGEN SULFIDE:
TEMP. - 50 DEGREES CENTIGRADE
DETECTOR - FID 8 X E-12

1-BUTENE:
TEMP. - 120 DEGREES CENTIGRADE
DETECTOR - FID 256 X E-11

PROPYLENE:
TEMP. - 120 DEGREES CENTIGRADE
DETECTOR - FID 512 X E-12

ETHYLENE OXIDE:
TEMP. - 120 DEGREES CENTIGRADE
DETECTOR - FID 512 X E-11

ACETYLENE:
TEMP. - 100 DEGREES CENTIGRADE
DETECTOR - FID 128 X E-10

Bioassay samples were prepared by diffusing the subject gas into the appropriate solvent. Due to analysis, solubility, and sample degradation problems associated with GHE (glycerol:water:ethanol in a 2:2:1 ratio [v/v]), ethanol was the preferred solvent for all the five gaseous samples, except acetylene, where acetone was utilized as the solvent. The solvent was placed in a gas washing bottle fitted with a frithed cylinder diffuser (Corning B1770) and the gas allowed to bubble through the solvent for approximately 10 minutes. A moderate positive back pressure was maintained to enhance dissolution. Ethylene oxide, 1-butene, and propylene were prepared at 0°C to increase their solubility; hydrogen sulfide and acetylene were prepared at ambient temperatures. The samples were transferred to Teflon-capped vials, maintained at their preparation temperature, and immediately delivered for Ames biotesting. Aliquots of each sample were removed for gas chromatographic analysis.

Analysis of the samples was performed on a Chromosorb 102 packed GC column with FI detection. Triplicate injections were made for each sample and the concentrations determined from the mean (see Table 2.2-2).

Table 2.2-2. Summary of Gaseous Samples Prepared for Ames Bioassay Testing

Sample	Concentration (μg/μl)	Temperature (°C)	Solvent
Hydrogen sulfide	17.5	15	Ethanol
Ethylene oxide	111.3	0	Ethanol
Acetylene	31.5	20	Acetone
1-Butene	1.3	0	Ethanol
Propylene	6.3	0	Ethanol

For the desorption studies of vapors from Tenax® resin, glass cartridges (21 x 3 cm) were loaded with ca. 12 grams of Tenax® resin. Each of three cartridges was spiked with 260 ng methylene chloride and 200 ng epichlorohydrin using a permeation system. The cartridges were stored approximately 48 hours at -17°C prior to desorption. They were removed from storage and immediately desorbed at 250°C. The desorption apparatus (Figure 2.2-2) consisted of glass, Teflon® or stainless steel surfaces and was configured in such a manner as to minimize unnecessary dead volume. Flowing helium carrier gas (40 ml/min) was used to pass the desorbed material through a 3-way valve (position AB) to a coiled 1 meter length of Teflon® tubing (1.35 min. ID) which was partially immersed in liquid nitrogen (LN_2). Purging was continued for 30 minutes to ensure complete removal and entrapment of the volatiles. At the end of this period the LN_2 bath was replaced by an ice/H_20 bath. After equilibration (~5 minutes) the 3-way valve was manipulated (position BC) to stop helium flow and to bring the syringe in line. The trapped volatiles were collected in 1.0 ml GHE and discharged from the syringe through the coil. The GHE solution passed into a 1 ml collection vial which was immersed in an ice/H_20 bath. The solution was immediately analyzed by purge and trap GC with Hall electrolytic conductivity detection. System and solvent blanks were prepared and analyzed with the samples.

Standards were prepared by spiking aliquots of vehicle (GHE) with epichlorhydrin and methylene chloride stock solutions in ethanol. Three point standard curves were determined for 93 ng to 310 ng injected for methylene chloride and 108 ng to 362 ng injected for epichlorohydrin.

Gas chromatography was performed on a Fisher-Victoreen series 4400 gas chromatograph fitted with an aqueous sample purge and trap apparatus. A 0.5 ml aliquot of the sample or standard was diluted to 4.0 mls with deionized, purged water, transferred to the purge apparatus and purged onto a Tenax® GC trap for 12 minutes with nitrogen carrier gas The Tenax® trap was then heated to 300°C and the volatiles passed onto a 6' 1% SP-1000 on Carbopak B column with 31 ml/min nitrogen carrier flow. The temperature program was 60°/2 minutes to 220°C at 6°/min. The compounds were detected on a Tracor 700 Hall electrolytic conductivity detector and the peak area electronically integrated. The minimum LOD (limit of detection) for epichlorhydrin and methylene chloride was 5 ng.

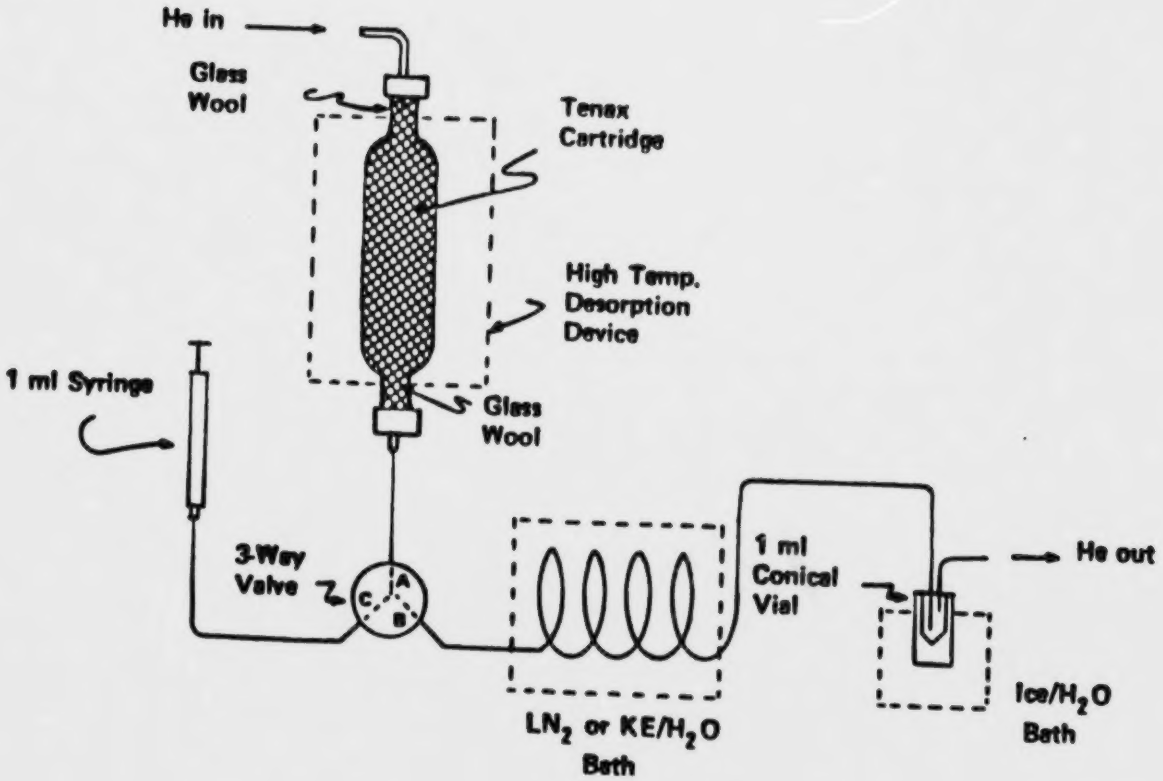
He in
Glass Wool
Tenax Cartridge
High Temp. Desorption Device
Glass Wool
1 ml Syringe
3-Way Valve
A
B
C
1 ml Conical Vial
He out
LN$_2$ or KE/H$_2$O Bath
Ice/H$_2$O Bath

Figure 2.2-2. Schematic of thermal desorption/vapor collection device.

3.0 Results and Discussion

3.1 Determination of Cell Type and Assay Conditions for Detection of Vapor-Phase Compounds in the Ames/Salmonella Mutagenicity Assay

Parameters investigated for detection of vapors in the Ames/*Salmonella* mutagenicity assay included: toxicity and mutagenicity testing of styrene oxide (a vapor-phase mutagen) with log- and stationary-phase cells of TA100 with the preincubation and plate incorporation techniques, mutagenicity testing of methylene chloride in the plate incorporation and preincubation techniques, the effect of headspace volume and different types of shaking (during preincubation) on the mutagenic potential of vapor-phase mutagens (styrene oxide and methylene chloride). The effect of solvents and metabolic activation on the mutagenic potential of vapor-phase mutagens, and the effect of preincubation time (from 10 to 60 minutes) at 37°C on the mutagenic potential of styrene oxide were also investigated. The results from these experiments were fully discussed in the progress reports for this task, and will be summarized here.

Results suggested that log-phase cells and the preincubation procedure were the more sensitive technique for detection of vapor-phase mutagens. Two experiments demonstrated that the preincubation procedure permitted detection of styrene oxide (SO) mutagenicity at doses similar to those in the plate incorporation procedure, and log-phase cells were more sensitive to the mutagenic effects of SO than stationary-phase cells of *Salmonella* strain TA100 (see Figures 3.1-1 and 3.1-2). Toxicity was significantly higher in the preincubation procedure than in the

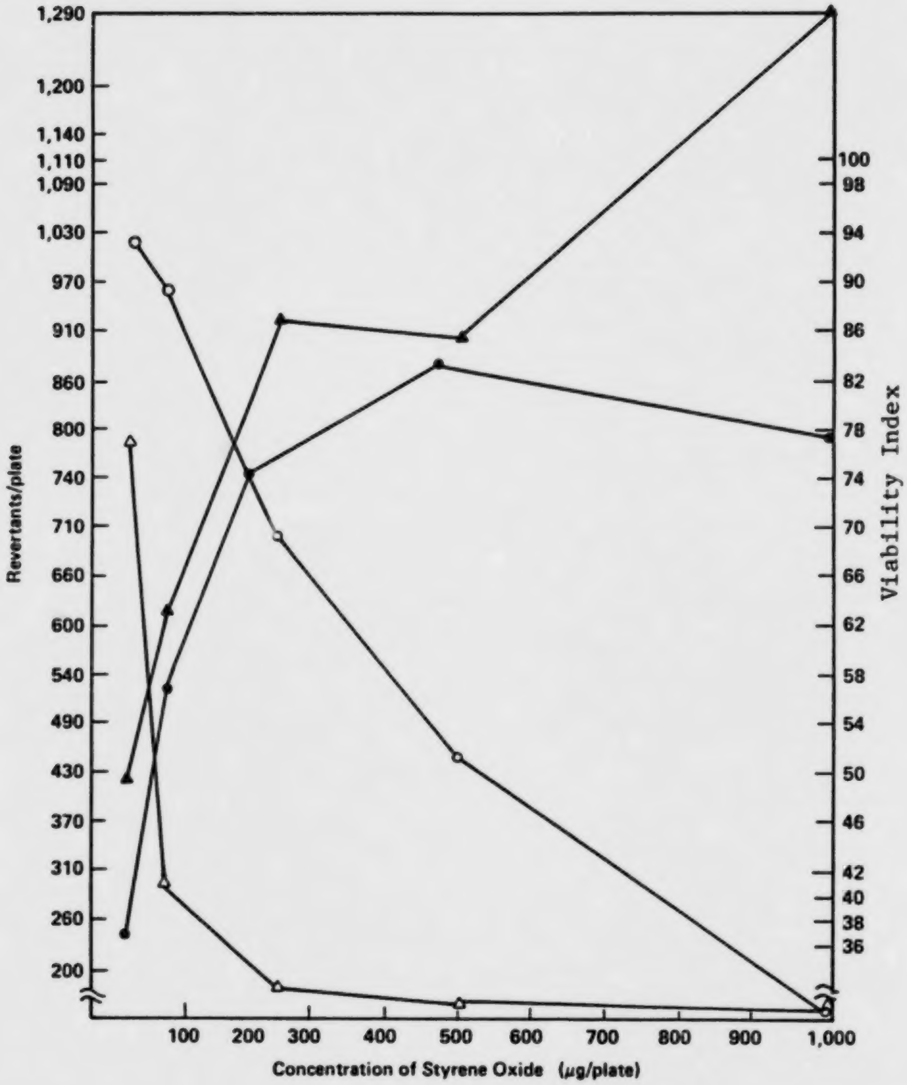

Figure 3.1-1. Plate incorporation of styrene oxide with log- and stationary-phase cells of Salmonella strain TA100 (Experiment 2). Symbols are: Mutagenicity to stationary-phase cells (●——●); toxicity to stationary-phase cells (O——O); mutagenicity to log-phase (▲——▲), toxicity to log-phase cells (Δ——Δ). Spontaneous backgrounds (mean of three plates) were: log-phase cells, 221 revertants and stationary-phase cells, 204 revertants.

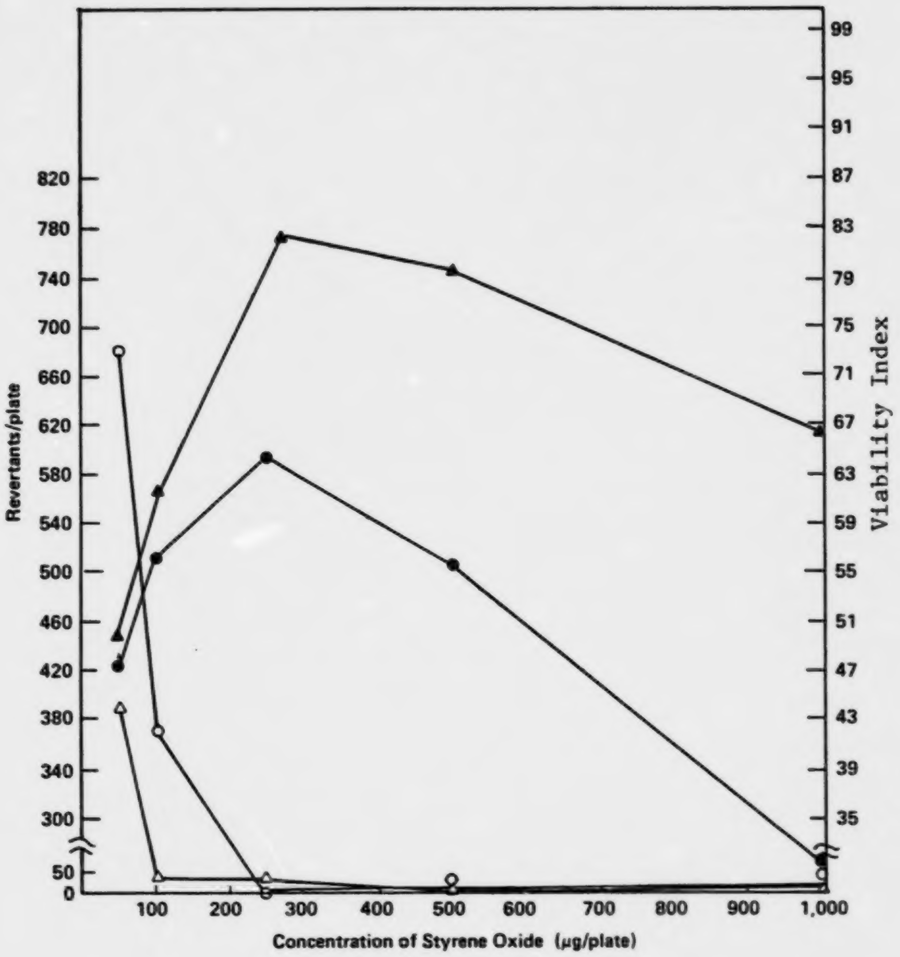

Figure 3.1-2. Preincubation of styrene oxide with log- and stationary-phase cells of Salmonella strain TA100 (Experiment 2). Symbols are: Mutagenicity of stationary-phase cells (●——●); toxicity of stationary-phase cells (O——O); mutagenicity of log-phase cells (▲——▲); toxicity of log-phase cells (Δ——Δ). Spontaneous backgrounds (mean of three plates) were: log-phase cells, 276 revertants, and stationary-phase cells 260 revertants.

plate incorporation procedure and log-phase cells were more sensitive to the toxic effects of SO (compare Figures 3.1.-2 and 3.1.-2, respectively). The higher toxicity in the preincubation procedure with log-phase cells indicated a closer association of bacteria and test compound, which was one of the major advantages of the liquid suspension preincubation technique when testing vapor-phase mutagens. When preincubation times of 5 to 30 minutes (in 5-minute intervals) were evaluated, the maximum linear mutagenic response of SO with TA100 was detected at 10 minutes (see Figure 3.1-3). An initial experiment evaluated preincubation times from 10 to 60 minutes and results suggested that the more linear preincubation time for vapor-phase mutagen detection was below 30 minutes at 37°C (data not shown).

The effect of headspace volume and shaking methods on the mutagenic potential of SO in the preincubation assay was also investigated. Log-phase cells of TA100 were preincubated in one-dram vials that were either full or half-full. Both types of vials were preincubated for 30 minutes at 37°C and shaken by three different types of shakers (wrist, rotator and roller drum). Results were similar with either full or half-full vials and any type of shaking; headspace volume and method of shaking did not significantly increase the mutagenic potential of SO. In addition, results with log-phase cells and full vials that were not shaken produced a significantly greater number of revertants than did any type of shaking. Consequently, the most sensitive method for detection of vapor-phase mutagens was established as preincubation with log-phase cells in full vials that were not shaken during preincubation. This protocol was utilized in the testing of the 12 vapor-phase mutagens

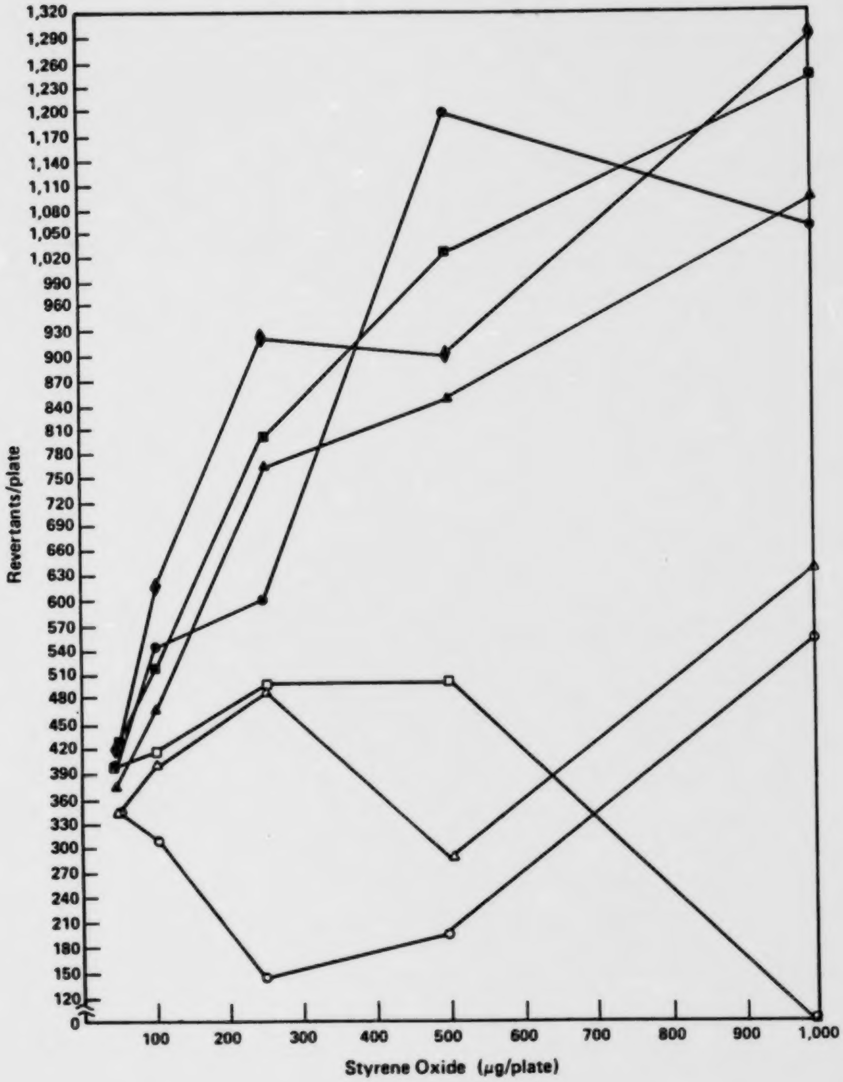

Figure 3.1-3. Effect of varying preincubation time on the mutagenic potential of styrene oxide to TA100; vials were full and preincubated at 37°C in a dry well bath with no shaking. Log-phase cells, grown on the day of the experiment were utilized. Symbols are: 0 min (plate incorporation (◆——◆); 5 min (●——●); 10 min (■——■); 15 min (▲——▲); 20 min (0——0); 25 (□——□); and 30 min (Δ——Δ) preincubation time. Spontaneous background rates averaged from 150 to 200 revertants/plate.

discussed in Section 3.2 of this report. Since these experiments were performed with only one chemical (SO), additional experiments should be conducted to confirm these findings with additional vapor-phase compounds and with S9 metabolic activation.

The effects of solvents and S9 metabolic activation on the mutagenic potential of vapor-phase mutagens was also investigated. SO and methylene chloride (MC) were tested with TA100 in the preincubation procedure (full vials at 37°C for 10 minutes with no shaking during preincubation), with and without the addition of 5% hamster liver S9 (HLI) in the following solvents: GHE, DMSO and ethanol. Log-phase cells, which were regrown from a stationary-phase culture on the day of the experiment, were utilized. Results indicated that the addition of S9 inhibited the mutagenic potential of SO and slightly increased the mutagenic potential of MC (Figure 3.1-4). The effect of DMSO, GHE and ethanol on the mutagenic potential of SO without S9 addition is summarized in Figure 3.1-5. The three solvents demonstrated similar mutagenic responses, but mutagenic activity was highest in DMSO followed by GHE. Mutagenic activity was depressed but present with ethanol. The magnitude of the mutagenic response may be due to the ability of the solvent to permeate cell membranes. A glycerin:ethanol solvent (2:1 ratio v/v) may be preferred over GHE, since the addition of water could inhibit compound solubility, and may therefore inhibit the mutagenic response of water insoluble vapor-phase mutagens. These results suggested that the solvent system for the Tenax® adsorption/desorption unit should be investigated further with regard to the effect that solvents may have on mutagenic potential of vapor-phase mutagens.

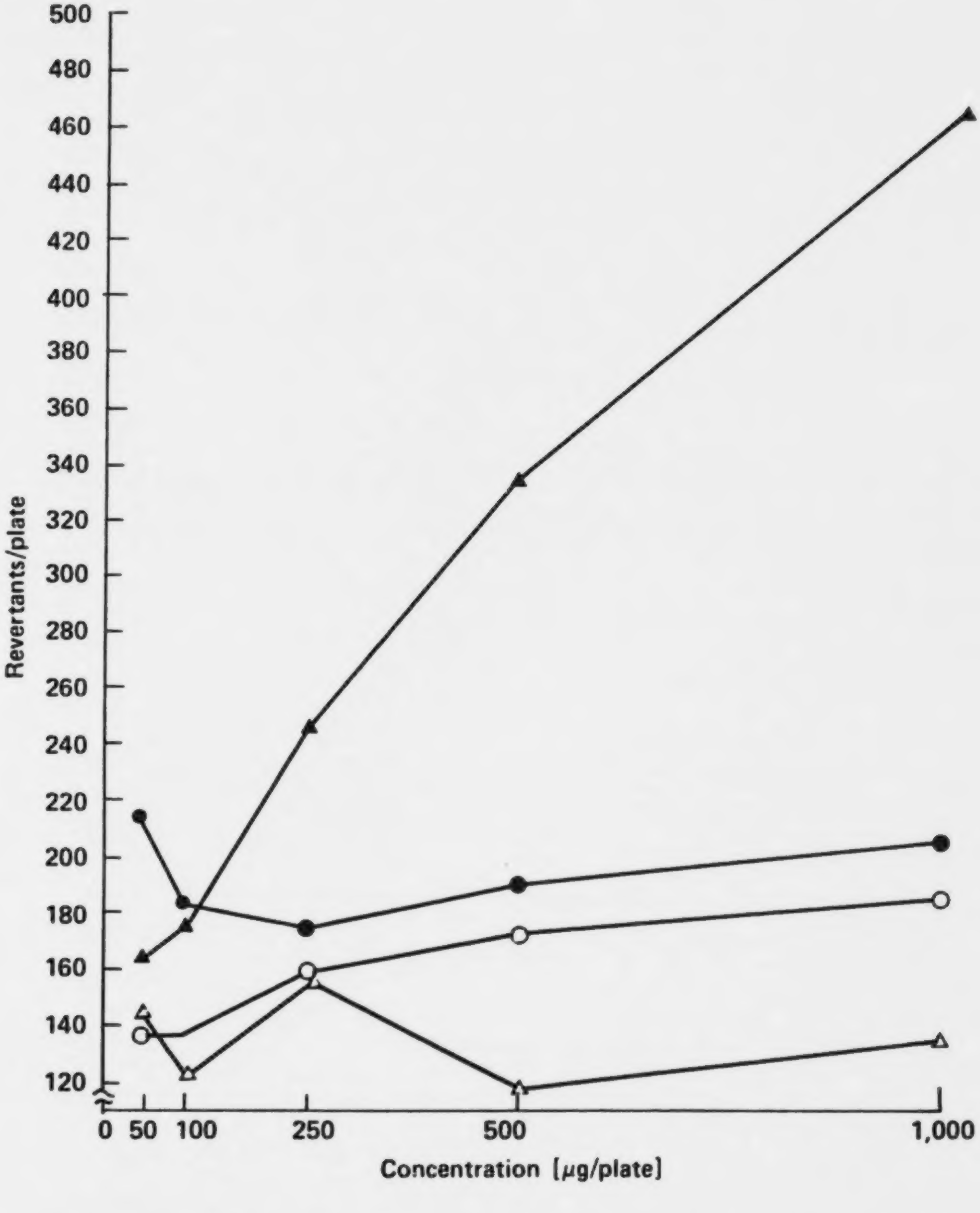

Figure 3.1-4. Effect of solvent (GHE) and S9 metabolic activation on the mutagenic potential of styrene oxide and methylene chloride with TA100. Symbols are: ●--styrene oxide + S9; ▲--styrene oxide - S9; o--methylene chloride + S9; Δ--methylene chloride - S9. Spontaneous background values were: 154 revertants with S9 and 159 revertants without S9.

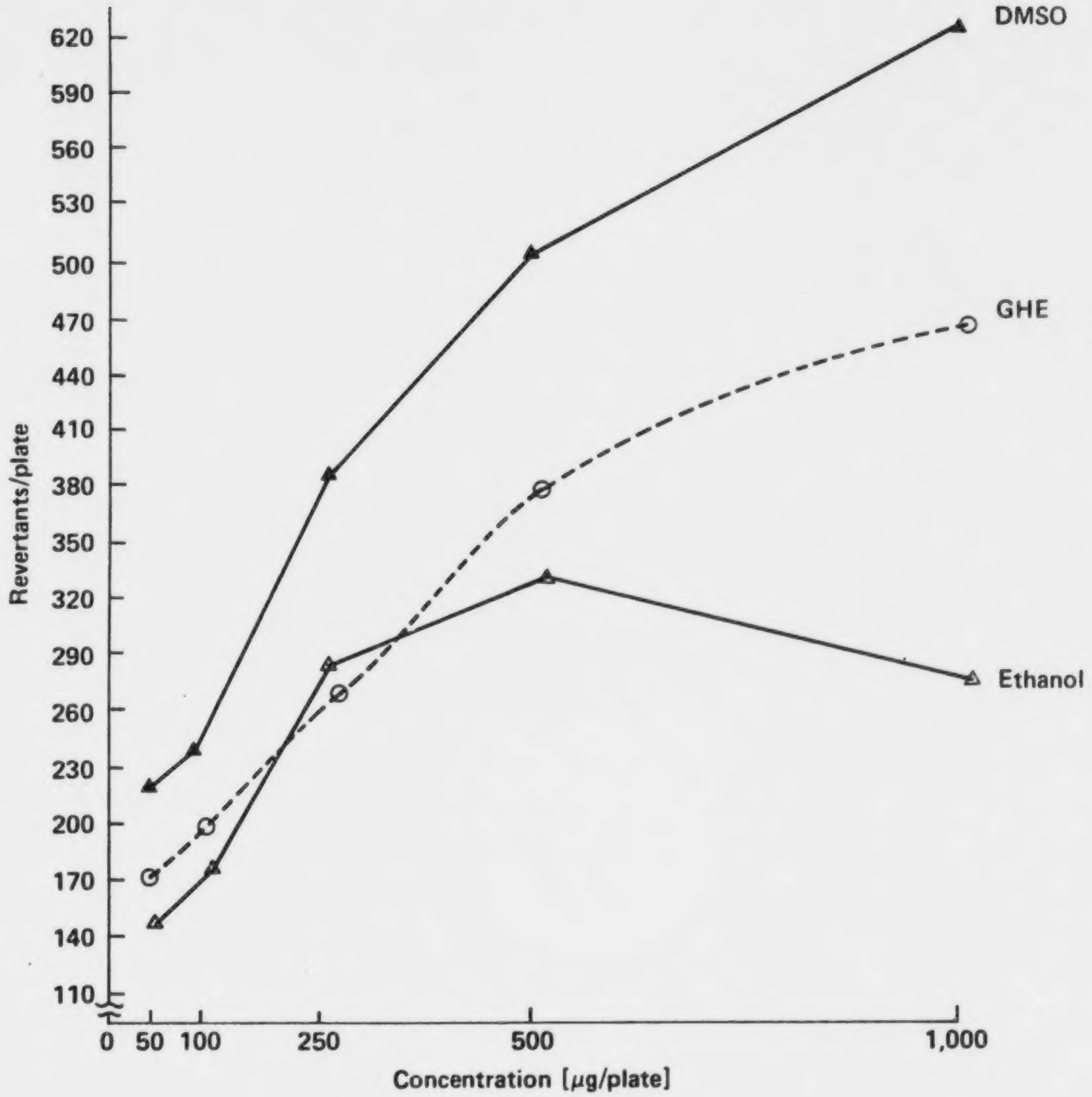

Figure 3.1-5. Summary Graph of the Testing of Styrene Oxide with TA100, Without S9 Addition. (See Figures 1-3 for Details of Experiment.)

Vapor-phase compounds also should be tested both with and without S9 addition.

3.2 Toxic and Mutagenic Potential of Twelve (12) Vapor-Phase Compounds

The preincubation technique developed above was utilized to test twelve (12) vapor-phase compounds: methylene chloride (MC), formaldehyde (FM), trichloroethylene (TRC), ethylene dichloride (EDC), epichlorohydrin (EC), nitropropane (NP), nitrobenzene (NB), hydrogen sulfide (HS), butene (BT), propylene (PP), acetylene (AC), and ethylene oxide (EO).

Samples were evaluated for toxicity at five doses before mutagenicity testing with and without addition of rat liver S9. (Methylene chloride was not tested for toxic potential because previous experiments with this chemical had established the nontoxic doses, and the five gases tested [H_2S, butene, propylene, acetylene and ethylene oxide] were not tested for toxic potential due to difficulty of sample preparation.) The raw data for the toxicity testing of the remaining six compounds are contained in the Appendix and are summarized in Table 3.2-1. Formaldehyde was highly toxic at doses greater than 100 μg/plate; the other five compounds were less toxic.

Mutagenicity testing parameters were: log-phase cells of TA97, TA98 and TA100 (regrown on the day of the experiment from an overnight stationary-phase broth culture); five doses, triplicate plates/dose, and 100 μl of solvent/plate. Acetylene was diluted in acetone; H_2S, butene, propylene and ethylene oxide was diluted in ethanol, and the remaining compounds were diluted in GHE (glycerin:water:ethanol) in a 2:12:1 ratio (v/v). GHE has been established as the solvent-of-choice for the Tenax® desorption unit/Ames preincubation system (EPA contract 68-02-2724).

Table 3.2-1. Summary of the Toxic Potential of Six Vapor-Phase Compounds[a]

	Doses Tested (μg/plate)	Nontoxic Doses[b] -S9	+S9[c]
Formaldehyde	1000, 500, 250, 100, 1.0	100[d]	250
Trichloroethylene	10,000, 3,333, 1,000, 333, 100	1000	333
Ethylene Dichloride	1000, 500, 250, 100, 50	1000	1000
Epichlorohydrin	10,000, 3,333, 1,000, 333, 100	3,333	3,333
Nitropropane	10,000, 3,333, 1,000, 333, 100	10,000	3,333
Nitrobenzene	10,000, 3,333, 1,000, 333, 100	3,333	3,333

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[a] TA100, triplicate plates/dose, 200-1000 colonies on histidine-supplemented media.

[b] Dose at which the viability index was greater than 50%.

[c] Rat liver S9 from Sprague-Dawley rats induced with Aroclor 1254.

[d] Lowest nontoxic dose was chosen for highest mutagenicity dose level.

Compounds were tested with 5% male Syrian Golden hamster liver S9 (HLI) and male Sprague-Dawley rat liver S9 (CSD) and without S9 addition. The protocol conditions were preincubation for 10 minutes at 37°C in full vials with no shaking during preincubation.

Raw data and dose response graphs for the mutagenicity testing of the 12 vapor-phase compounds are contained in the appendix. The data are qualitatively summarized in Table 3.2-2. Methylene chloride, ethylene dichloride, epichlorohydrin and ethylene oxide were mutagenic. Approximate initial slope values for these four compounds are contained in Table 3.2-3. Criteria for a positive mutagenic response on strains TA97, TA98 and TA100 were defined as a mutagenic response at two increasing dose levels that was at least twice the spontaneous background values. From evaluation of the approximate slope values, the positive mutagenic vapors can be ranked from high to low as follows: Ethylene oxide > Epichlorohydrin > Ethylene dichloride >> methylene chloride. Ethylene oxide and epichlorohydrin were strong direct-acting base substitution mutagens, ethylene dichloride was a moderate direct-acting base substitution mutagen, and methylene chloride was a weak direct-acting frameshift mutagen. Addition of S9 did not increase mutagenic activity, and in the cases of ethylene dichloride and ethylene oxide, actually decreased mutagenic activity significantly.

It should be noted that high test concentrations of the gaseous compounds (H_2S, butene, propylene, acetylene and ethylene oxide) were difficult to obtain in liquid suspension. The highest mutagenicity test dose was limited by the solubility of the test gas in the test solvent (acetone for acetylene and ethanol for the other four gases). For

Table 3.2-2. Mutagenicity of Twelve Vapor-Phase Compounds

Vapor Compound[a]	TA97			TA98			TA100		
	-S9	RLI	HLI	-S9	RLI	HLI	-S9	RLI	HLI
Methylene Chloride (GHE)	-	-	-	W^+	W^+	W^+	-	-	-
Formaldehyde (GHE)	-	-	-	-	-	-	-	-	-
Trichloroethylene (GHE)	-	-	-	-	-	-	-	-	-
Ethylene Dichloride (GHE)	-	-	-	-	-	-	W^+	-	-
Epichlorohydrin (GHE)	++[c]	+	++	-	-	W^+	+++	+++	+++
Nitropropane (GHE)	-	-	-	-	-	-	-	-	-
Nitrobenzene (GHE)	-	-	-	-	-	-	-	-	-
H_2S[b] (ETOH)	-	-	-	-	-	-	-	-	-
Butene[b] (ETOH)	-	-	-	-	-	-	-	-	-
Propylene[b] (ETOH)	-	-	-	-	-	-	-	-	-
Acetylene[b] (acetone)	-	-	-	-	-	-	-	-	-
Ethylene Oxide[b] (ETOH)	-	-	-	-	-	-	++	-	+

[a] Preincubation, 37°C, 10 minutes, full vials, no shaking, Isotemp.

[b] Gas at room temperature.

[c] Ranking legend:

	W^+	+	++	+++
TA97	2-3*	3-5	5-8	>8
TA100	2-3	3-5	5-8	>8
TA98	2-4	4-10	10-25	>25

*Mutagenic ratios at greatest response.

$$\text{Mutagenic ratio} = \frac{\text{\# revertants with sample}}{\text{\# revertants in solvent}}$$

Table 3.2-3. Approximate Initial Slope Values for Mutagenic Vapor-Phase Compounds

	TA97			TA98			TA100		
	-S9	RLI	HLI	-S9	RLI	HLI	-S9	RLI	HLI
Methylene Chloride	-	-	-	0.05	0.08	0.08	-	-	-
Ethylene Dichloride	-	-	-	-	-	-	0.60	-	-
Epichlorohydrine	0.92	0.86	0.82	-	-	0.03	2.35	2.01	1.63
Ethylene Oxide	-	-	-	-	-	-	5.12	-	3.18

example, the highest test dose for butene was 130 μg/plate, for acetylene was 31 μg/plate and for ethylene oxide was 111 μg/plate. Propylene was soluble in ethanol and the highest dose obtained was 626 μg/plate. H_2S was soluble in ethanol at a high dose of 1,750 μg/plate. Additional experiments should be conducted with these vapors in the gaseous state, where much higher dose levels can be attained. Further testing with ethylene oxide should prove beneficial in the comparison of mutagenic testing procedures for vapor-phase mutagens. Ethylene oxide is a gas at room temperature, and is also mutagenic in liquid suspension. Comparison of data of ethylene oxide in solution and in the gaseous state should provide an insight as to the effects of liquification (as performed with the Tenax® desorption unit) on the mutagenic potential of gases. It may be possible to cool the vapors after Tenax® desorption and exposed them directly to the bacterial test system.

3.3 Recovery Studies of Vapors from Tenax® Resin

Recovery of epichlorohydrin was 22% and 29% for two of the spiked cartridges, but was not detected in a third. In a previous study (EPA contract No. 68- 02-2724) of two compounds chemically related to epichlorohydrin, similar recovery was observed (ethylene oxide, 20% and propylene oxide, 28%). Methylene chloride was not detected in any of the three samples.

The poor recovery of these compounds is probably due to several complementing factors. Epoxides will readily hydrolyze to glycols in solutions of acidic pH (GHE has a pH of 5.0) or at elevated temperatures in the presence of moisture, thus some loss of epichlorohydrin may be expected. The failure to recover methylene chloride may be due to poor solubility in the vehicle. From these observations, it is suggested that pure ethanol be used as the recovery vehicle for cryotrapped volatiles. Some changes in desorption and purge times could be implemental in future studies to increase overall recovery.

The recovery study of nitrobenzene was not completed. Several problems were encountered with the GC analysis of this compound in the GHE vehicle and an acceptable limit of detection was not obtained for an environmentally realistic sample.

4.0 Recommendations for Future Testing

1. Evaluate plastic bags as exposure chambers.

2. Test vapor-phase compounds with the new Salmonella tester strain, TA102, which is effective in detecting oxidative mutagens.

3. Radiolabel vapor-phase compounds to evaluate the amount of vapor that is actually absorbed by the bacteria and test system.

4. Evaluate the effect that solvents, shaking and amount of headspace in the preincubation vials have on the mutagenic potential of potent vapor-phase mutagens.

5.0 Project Summary

5.1 Monthly Task Report (TR-1)

5.2 Cost/Schedule Status Report (PR-2)

5.3 Cumulative Budget Performance

5.4 Completed Milestones for EPA Contract 68-21-3170-082

MONTHLY TASK REPORT (TR-1)

FOR PROJECTS SUPPORTED BY
INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH & DEVELOPMENT/ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

TO/TD TITLE Validation of Chemical and Biological Techniques for Evaluation of Vapors in Ambient Air/Mutagenicity Testing of Twelve (12) Vapor-Phase Compounds

COMPANY, DIVISION Research Triangle Institute, Chemistry and Life Sciences Group

CONTRACTOR'S TASK LEADER (FOR THIS TO/TD)

NAME Thomas J. Hughes
TITLE Genetic Toxicologist **PHONE** 541-6148
ADDRESS RTI, Bldg. 3
Research Triangle Park, NC **ZIP CODE** 27709

EPA TASK OFFICER (FOR THIS TO/TD) Dr. Larry Claxton

CONTRACTOR'S PROJECT MANAGER (FOR OVERALL CONTRACT)

NAME Dr. Forest Mixon
TITLE Manager **PHONE** 541-5917
ADDRESS RTI/PCED, Bldg. 9
Research Triangle Park, NC **ZIP CODE** 27709

EPA PROJECT OFFICER (FOR OVERALL CONTRACT) Alice D. Gagnon

1	9	12	18	
68 21 3170	082	M M D D Y Y 06 30 83	D	**TASK START DATE** 10/15/82 **TASK COMPLETE DATE** 06/30/83
CONTRACT NUMBER	**TO/TD NUMBER**	**REPORT PERIOD ENDING DATE**		

598	598	598	-0-
CUMULATIVE MANHOURS EXPENDED TO DATE	**CURRENT TARGET**	**ESTIMATE AT COMPLETION**	**VARIANCE AT COMPLETION**

PROGRESS DESCRIPTION ABSTRACT:
19 **(KEYPUNCHED AND PRINTED IN THE IERL/RTP MONTHLY STATUS REPORT.)**

01 Results suggested that: (1) recoveries of a
02 model vapor-phase compound from Tenax^R resin
03 ranged from 22 to 29%; (2) log-phase cells and
04 the preincubation technique were the preferred
05 methods for detection of vapor-phase mutagens;
06 (3) the maximum linear mutagenic response was
07 detected with 10 minutes preincubation, in full
08 vials, with no shaking during preincubation;
09 (4) solvent type and metabolic activation did
10 effect mutagenic potential, and (5) ethylene
11 oxide, epichlorohydrin, ethylene dichloride
12 and methylene chloride were mutagenic.

MATERIAL WHICH RUNS OVER THE 12-LINE LIMIT WILL BE TRUNCATED

77 ☐ 78 ☐ 79 ☐ 80 ☐

A NOTE TO THE AUTHOR:

MANY COMMONLY-USED SCIENTIFIC SYMBOLS ARE NOT AVAILABLE TO THE KEYPUNCHER, SO PLEASE AVOID USING THE FOLLOWING:

(1) THE DEGREE SYMBOL [300°F. WILL APPEAR AS 300F.]
(2) THE PLUS-OR-MINUS SIGN [± WILL APPEAR AS +]
(3) GREEK SYMBOLS [KEYPUNCHER WILL LEAVE BLANKS WHEN GREEK SYMBOLS ARE ENCOUNTERED]
(4) SCIENTIFIC NOTATION [10^6 WILL APPEAR AS 106] [H_2SO_4 WILL APPEAR AS H2SO4]

THE FOLLOWING SYMROLS CAN BE KEYPUNCHED:
> < % + - = ¢ * $ / @ = &

THIS FORM IS USED FOR INFORMATION TRANSFER ONLY - IT IS NOT INTENDED TO REPLACE THE COMPREHENSIVE PROGRESS DESCRIPTION REQUIRED BY THE EPA PROJECT OFFICER

FOR USE BY IERL/RTP **BRANCH CHIEF INITIALS:** ______

1. INCLUDE AS MAJOR ITEM IN IERL/RTP MONTHLY REPORT. YES ☐ NO ☐
2. PROJECT REQUIRES TOP MANAGEMENT ATTENTION. YES ☐ NO ☐
3. SEE COMMENTS ON BACK FOR LABORATORY MANAGEMENT. YES ☐ NO ☐

EPA(RTP) 297

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COST/SCHEDULE STATUS REPORT (PR-2)

Contractor name: Research Triangle Institute

Estimated contract cost *(excluding fee)* 24,964

Thomas J. Hughes, Genetic Toxicol.
Contractor project manager name, title

Signature Thomas J Hughes Date 7-12-83

EPA project officer: Dr. Larry Claxton

1 6 8 0 2 3 1 7 0 Contract No.

9 0 8 2 Task/TD No.

12 M M D D Y Y 0 6 3 0 8 3 End of reporting period

18 C 13

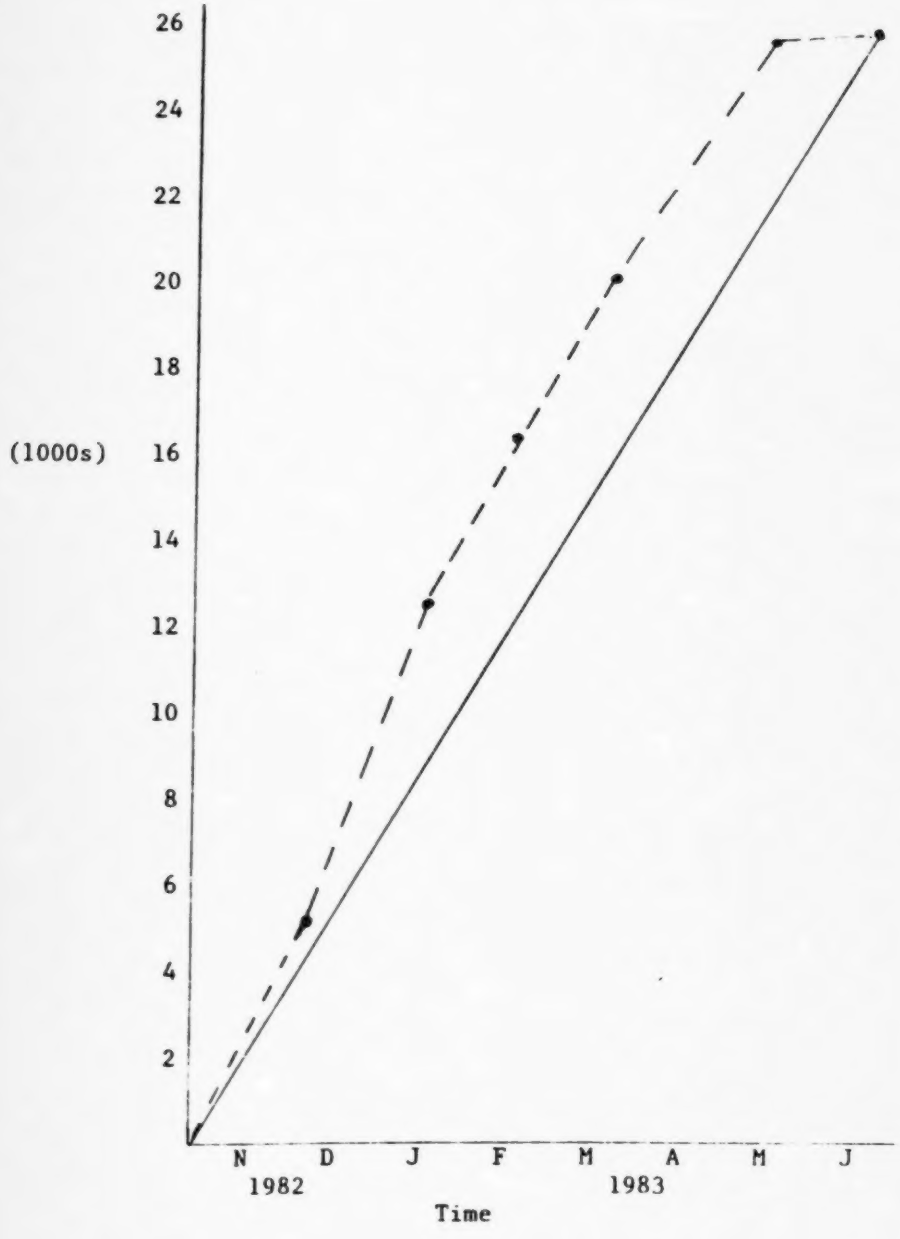
Performance data[a]

(1) Work breakdown structure		Cumulative cost to date ($1000's)					Cost at completion ($1000's)		
		Budgeted costs		(4) Actual costs of work performed (ACWP)	Variance				
No.	Name	(2) Work scheduled (BCWS)	(3) Work performed (BCWP)		(5) Schedule	(6) Cost	(7) Budgeted	(8) Latest revised estimate	(9) Variance
1	Chemical validation	6.0	6.0	6.0	0	0	3.4		+2.6
2	Ames validation	9.0	8.8	8.8	0	0	5.7		+3.1
3	Mutagenicity studies	9.0	9.0	9.0	0	0	11.5		-2.5
4	Reports	0.7	0.7	0.7	0	0	2.0		-1.3
5	Contract	0.5	0.5	0.5	0	0	2.4		-1.9
	General and administrative								
	Management reserve								
9 9 9 9 9	Total *(excluding fee)*	25.2	25.0	25.0	.	.	25.0	.	0.0 3
22 23 24 25 26		27 28 29 30 31 32 33	34 35 36 37 38 39 40	41 42 43 44 45 46 47	48 49 50 51 52 53	54 55 56 57 58 59	60 61 62 63 64 65 66	67 68 69 70 71 72 73	74 75 76 77 78 79

[a]All costs are exclusive of fee.

EPA (RTP) 401

5.3 Cumulative Budget Performance (June 30, 1983)
EPA Contract No. 68-02-3170-082



5.4 Completed Milestones for EPA Contract 68-21-3170-082

June 30, 1983

		Date Planned	Date Achieved
M1	Work Plan submitted	10/21/82	10/19/82
M2	Project organizational meeting with EPA Project Officer	10/28/82	10/28/82
M3	Chemical validation studies started	11/1/82	11/1/82
M4	Ames/preincubation studies started	11/1/82	11/1/82
M5	Ames/preincubation studies completed	1/15/83	2/4/83
M6	Compounds tested for mutagenicity in preincubation assay	1/15/83 to 5/30/83	3/18/83
M7	Chemical validation studies completed	5/30/83	5/22/83
M8	Final Report completed	6/30/83	6/30/83

Appendix

Raw Toxicity and Mutagenicity Data of Twelve (12) Vapor-Phase Compounds in the Ames/*Salmonella* Assay

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Legend for Computer Output

EXP DATE = Date of the experiment.

Test type = Plate incorporation, spot, preincubation, or agar well test

Dilution = Microliters of S9 in one ml of S9 mix

Mixture = Microliters of S9 mix per plate

Chemical = Code for chemical tested

Strain = *Salmonella* strain used

Plated = Microliters of S9 mix plated for sterility plate

Technician = Code for the technician who performed the work

Contract No. = Contract number of project

Activation = Code number for the batch of S9 mix
Blank for testing without S9

Batch = Code for the strain batch

Colonies = Number of colonies on S9 sterility plate
Generally blank if S9 was sterile

S054 = Solvent (Dimethylsulfoxide)

P = Positive controls

P-01 = Sodium azide
P-02 = 9-Aminoacridine
P-03 = 2-Nitrofluorene
P-04 = 2-Aminoanthracene

STD DEV = Standard deviation of replicate plate counts

Q/C = Quality control column

A = Acceptable, i.e., within the ranges specified for each project
N/A = Not acceptable

VR = Viability ratio, the ratio of surviving colonies with sample to the surviving colonies of the solvent control

TOX = Toxicity - an asterisk appears in this column for the lowest dose with a viability ratio of 0.5 or greater

(continued)

Legend for Computer Output (completed)

MR = Mutagenic ratio - the ratio of the number of revertants with sample over the number of revertants with the solvent control

MEC = Minimum effective concentration, the lowest dose with a MR of 2.0 or greater for TA98 and TA100, and 3.0 or greater for TA1535, TA1537 or TA1538

Please note that for the mutagenicity data, the positive controls and the samples are in units of micrograms/plate, while the solvent controls are in units of microliters/plate.

```
                         TOXICITY OF FM  - TA100

T O X I C I T Y                                  CONTRACT NO.: 191482
EXP DATE: 032883     CHEMICAL: FM                ACTIVATION:
TEST TYPE: 05        STRAIN: TA100               BATCH: C273
DILUTION=   :        PLATED=                     COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV          VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99       0.00    256         174        360       263.3      93.2           1.0
             1.00    451         468        535       484.7      44.4           1.8
           100.00    224         241        244       236.3      10.8           0.9
           250.00    143           0        149        97.3      84.3           0.4    *
           500.00      0           0          0         0.0       0.0           0.0
          1000.00    495         391        123       336.3     191.9           1.3

T O X I C I T Y                                  CONTRACT NO.: 191482
EXP DATE: 032883     CHEMICAL: FM                ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA100               BATCH: C273
DILUTION=  1: 20     PLATED= 100                 COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV          VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99       0.00    256         174        360       263.3      93.2           1.0
             1.00    310         350        305       321.7      24.7           1.2
           100.00    251         275        336       287.3      43.8           1.1
           250.00    150         109        152       137.0      24.3           0.5    *
           500.00     21           9          8        12.7       7.2           0.0
          1000.00      0           0          0         0.0       0.0           0.0
```

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PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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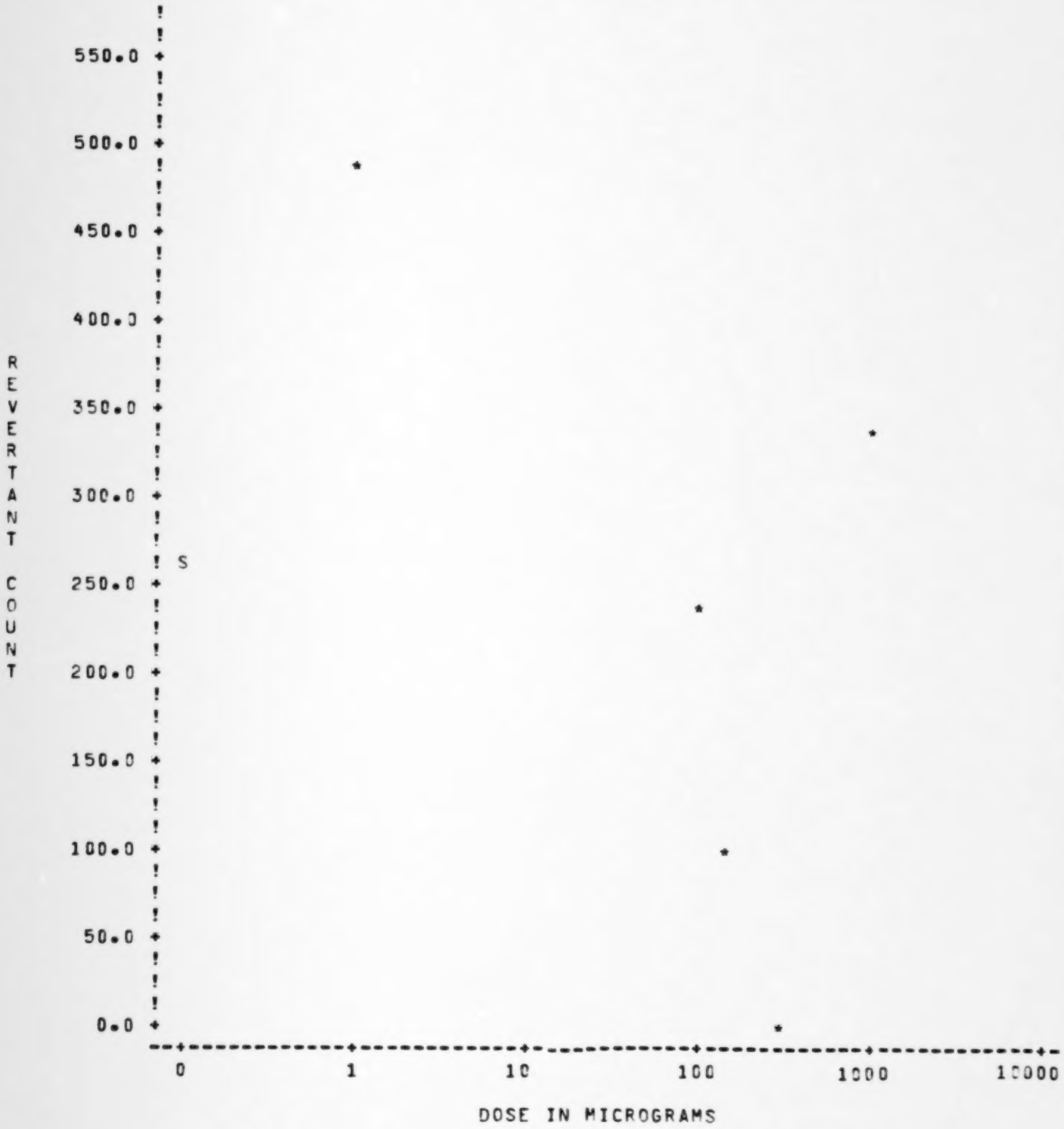

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               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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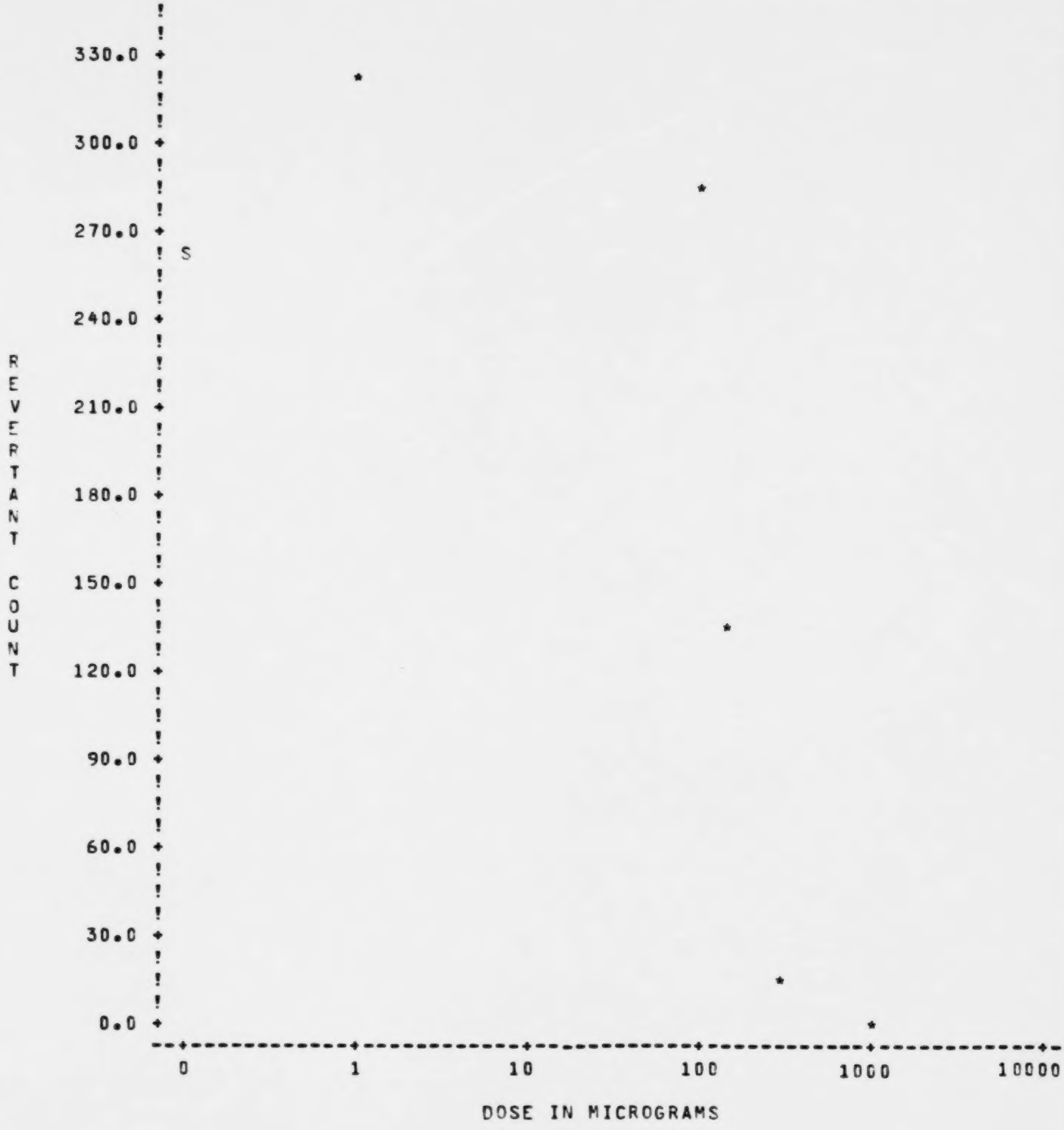

```
                             TOXICITY OF TRC  - TA100

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TEST TYPE: 05       STRAIN: TA100             BATCH: C273
DILUTION=   :       PLATED=                   COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV         VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99       0.00    256        174        360       263.3      93.2          1.0
           100.00    410        332        302       348.0      55.7          1.3
           333.00    410        367        446       407.7      39.6          1.5
          1000.00    151        203        221       191.7      36.4          0.7
          3333.00     16          0          0         5.3       9.2          0.0     *
         10000.00     17         52         22        30.3      18.9          0.1

T O X I C I T Y                               CONTRACT NO.: 191482
EXP DATE: 032883    CHEMICAL: TRC             ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100             BATCH: C273
DILUTION=  1: 20    PLATED= 100               COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV         VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99       0.00    256        174        360       263.3      93.2          1.0
           100.00    119        365        410       298.0     156.6          1.1
           333.00    429        436        383       416.0      28.8          1.6
          1000.00     51        187         46        94.7      80.0          0.4     *
          3333.00      0          0          0         0.0       0.0          0.0
         10000.00      0          0          0         0.0       0.0          0.0
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           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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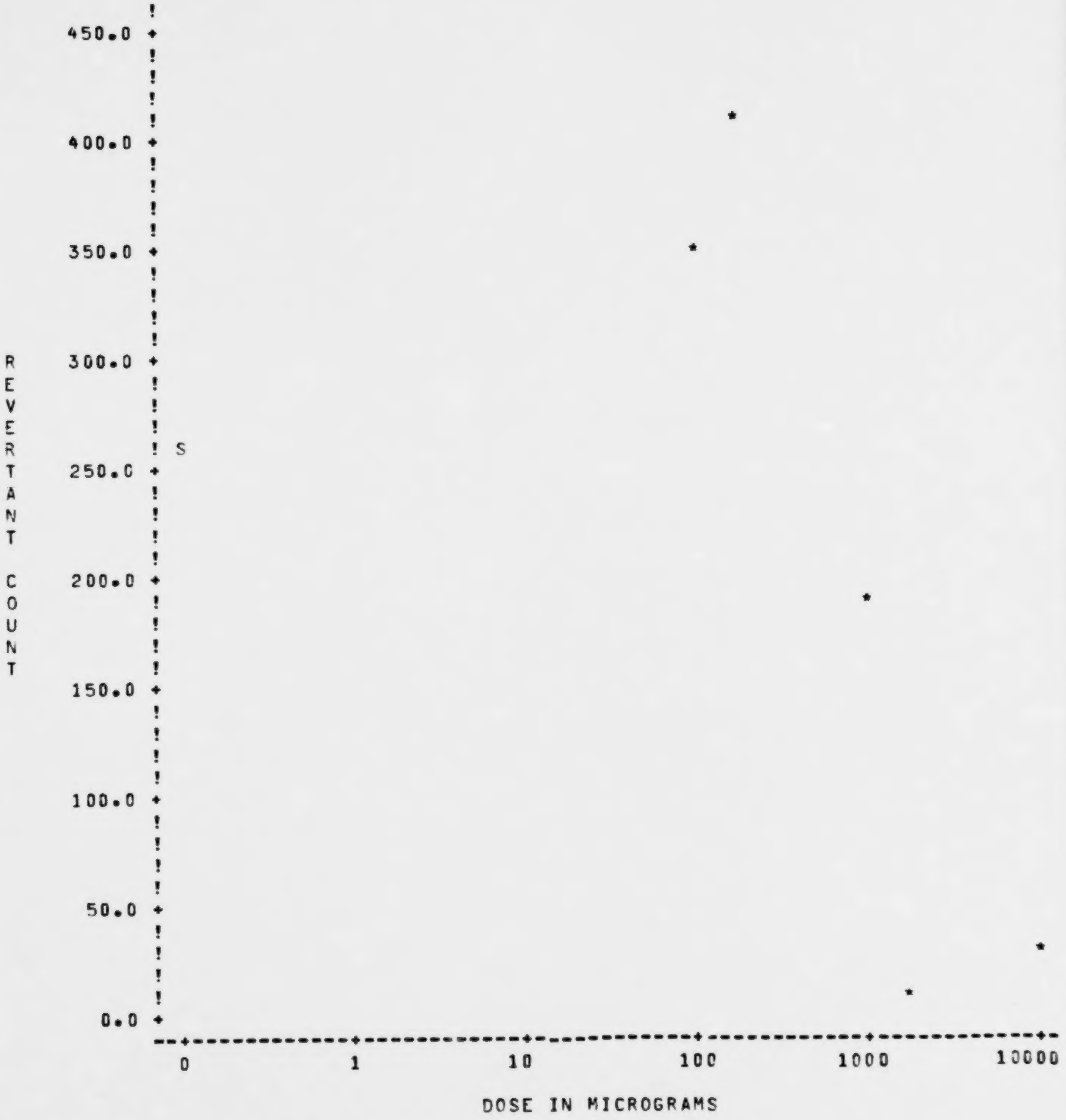

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           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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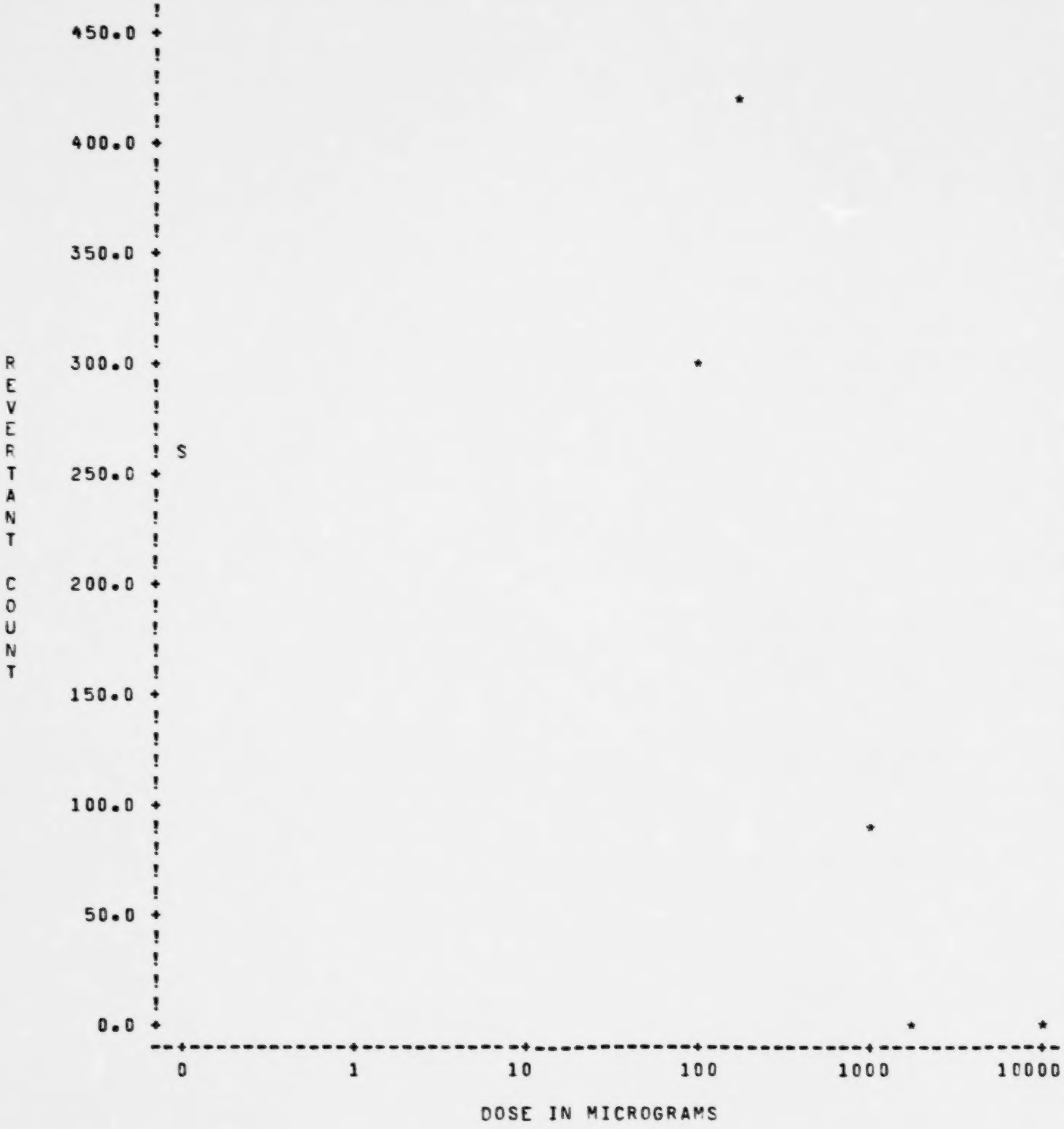

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                              TOXICITY OF EDC  - TA100

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EXP DATE: 032883    CHEMICAL: EDC            ACTIVATION:
TEST TYPE: 05       STRAIN: TA100            BATCH: C273
DILUTION=   :       PLATED=                  COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV        VR    TOX
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99      0.00     256       174       360      263.3     93.2         1.0
           50.00     483       484       427      464.7     32.6         1.8
          100.00     467       530       375      457.3     78.0         1.7
          250.00     347       154       364      288.3    116.6         1.1
          500.00     388       342       404      378.0     32.2         1.4
         1000.00     327       269       343      313.0     38.9         1.2

T O X I C I T Y                              CONTRACT NO.: 191482
EXP DATE: 032883    CHEMICAL: EDC            ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100            BATCH: C273
DILUTION=  1: 20    PLATED= 100              COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV        VR    TOX
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99      0.00     256       174       360      263.3     93.2         1.0
           50.00     410       428       288      375.3     76.2         1.4
          100.00     424       462       457      447.7     20.6         1.7
          250.00     440       365       392      399.0     38.0         1.5
          500.00     506       442       567      505.0     62.5         1.9
         1000.00     308       234       432      324.7    100.0         1.2
```

```
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            PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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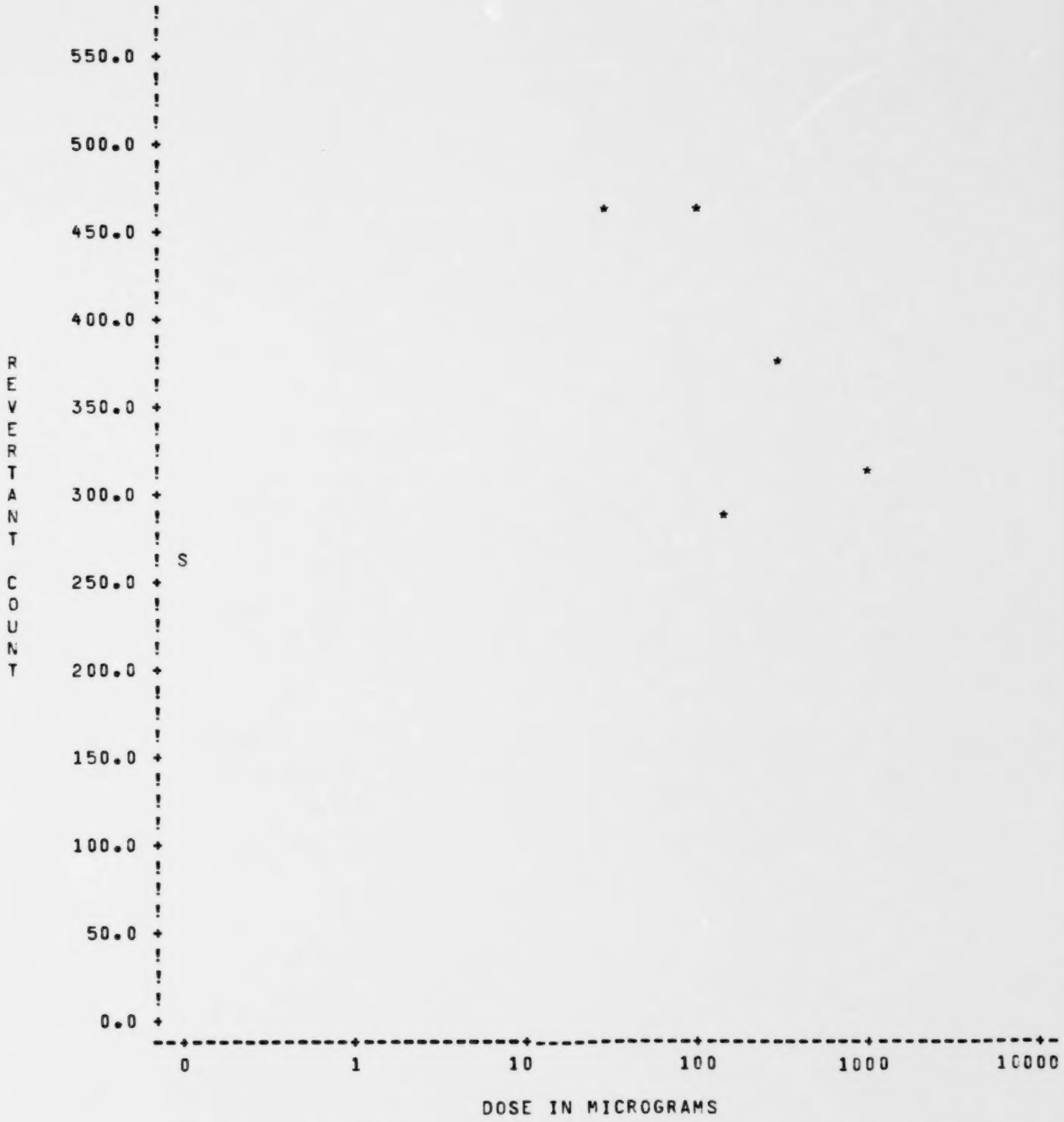

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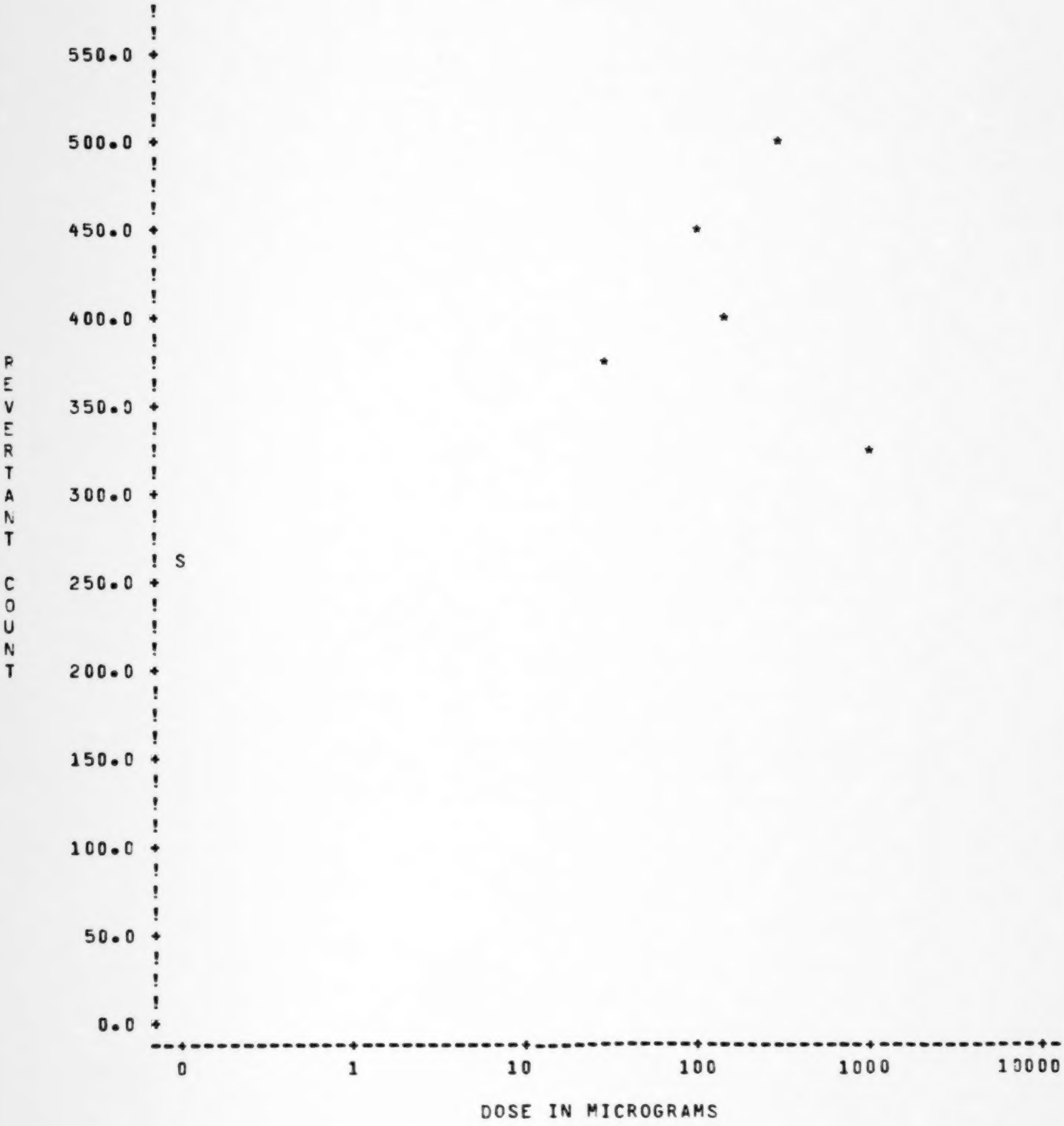

TOXICITY OF EC - TA100

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TEST TYPE: 05        STRAIN: TA100                BATCH: C273
DILUTION=   :        PLATED=                      COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV         VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00     256        174        360       263.3      93.2          1.0
          100.00     267        554        433       418.0     144.1          1.6
          333.00     375        532        523       476.7      88.2          1.8
         1000.00     369        342        502       404.3      85.7          1.5
         3333.00     425        537        599       520.3      88.2          2.0
        10000.00      80        124        167       123.7      43.5          0.5    *

T O X I C I T Y                                   CONTRACT NO.: 191482
EXP DATE: 032883     CHEMICAL: EC                 ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA100                BATCH: C273
DILUTION=  1: 20     PLATED= 100                  COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV         VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00     256        174        360       263.3      93.2          1.0
          100.00     463        533        405       467.0      64.1          1.8
          333.00     391        304        337       344.0      43.9          1.3
         1000.00     624        438        450       504.0     104.1          1.9
         3333.00     683        745        624       684.0      60.5          2.6
        10000.00       0          0          0         0.0       0.0          0.0    *
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           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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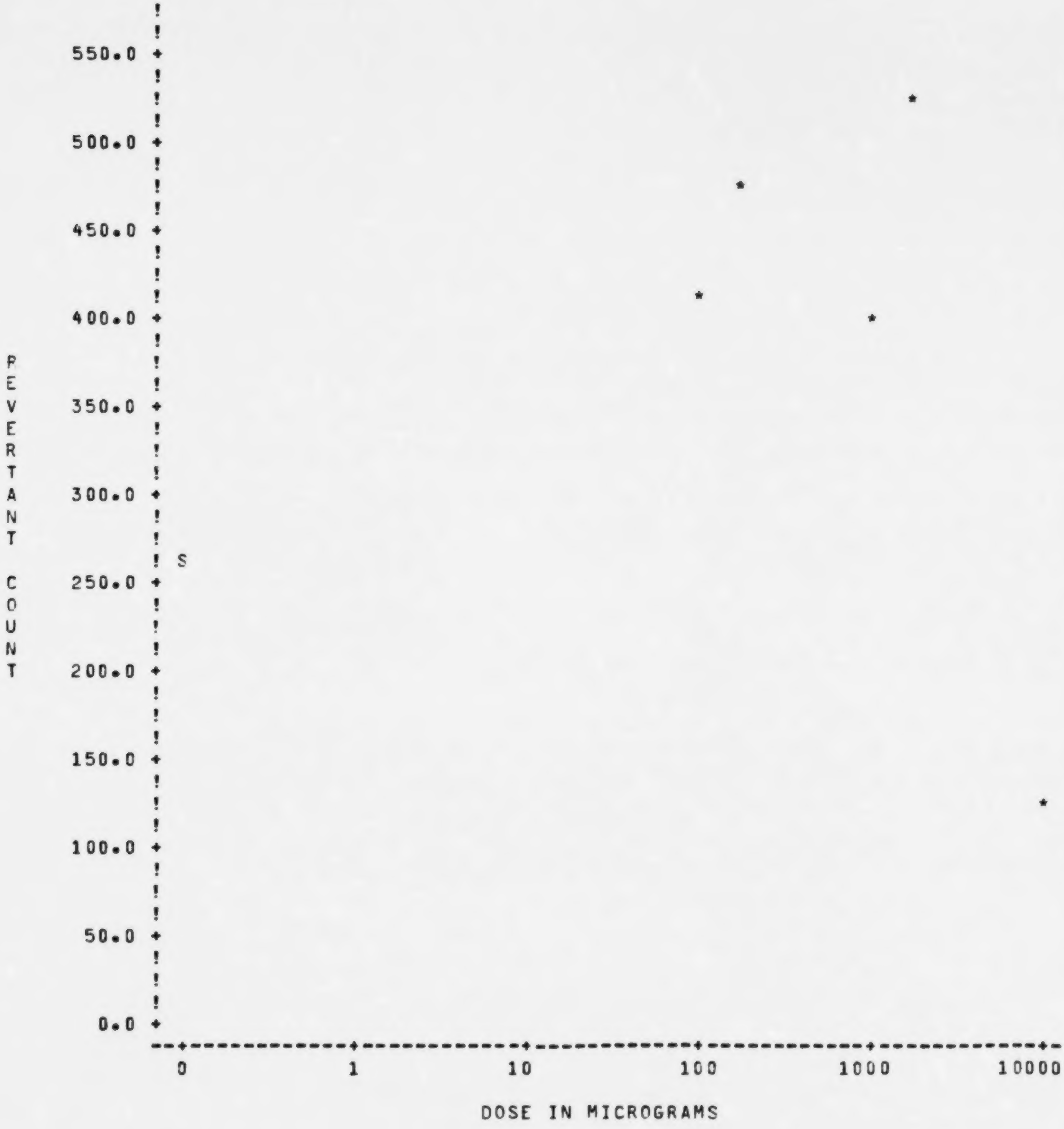

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               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
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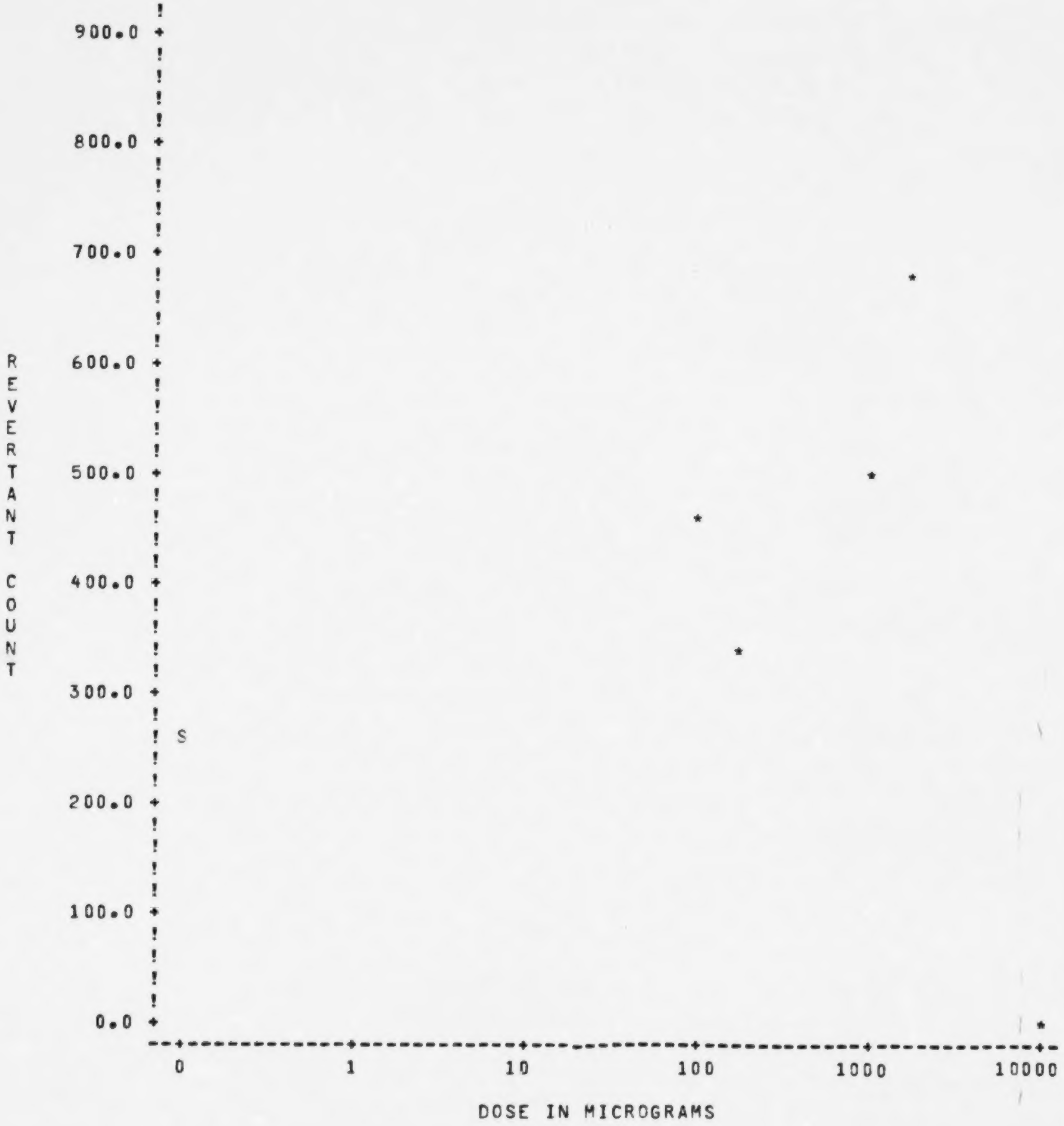

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                              TOXICITY OF NP  - TA100

T O X I C I T Y                                  CONTRACT NO.: 191482
EXP DATE: 032883    CHEMICAL: NP                 ACTIVATION:
TEST TYPE: 05       STRAIN: TA100                BATCH: C273
DILUTION=   :       PLATED=                      COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE    STD DEV          VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT      COUNT

 S1 99       0.00    256        174        360       263.3       93.2           1.0
           100.00    478        431        396       435.0       41.1           1.7
           333.00    479        387        305       390.3       87.0           1.5
          1000.00    365        460        283       369.3       88.6           1.4
          3333.00    190        234        326       250.0       69.4           0.9
         10000.00    277        225        245       249.0       26.2           0.9

T O X I C I T Y                                  CONTRACT NO.: 191482
EXP DATE: 032883    CHEMICAL: NP                 ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100                BATCH: C273
DILUTION=  1: 20    PLATED= 100                  COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE    STD DEV          VR    TOX
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT      COUNT

 S1 99       0.00    256        174        360       263.3       93.2           1.0
           100.00    491        309        390       396.7       91.2           1.5
           333.00    393        475        508       458.7       59.2           1.7
          1000.00    401        334        445       393.3       55.9           1.5
          3333.00    462        396        356       404.7       53.5           1.5
         10000.00     82         75         76        77.7        3.8           0.3    *
```
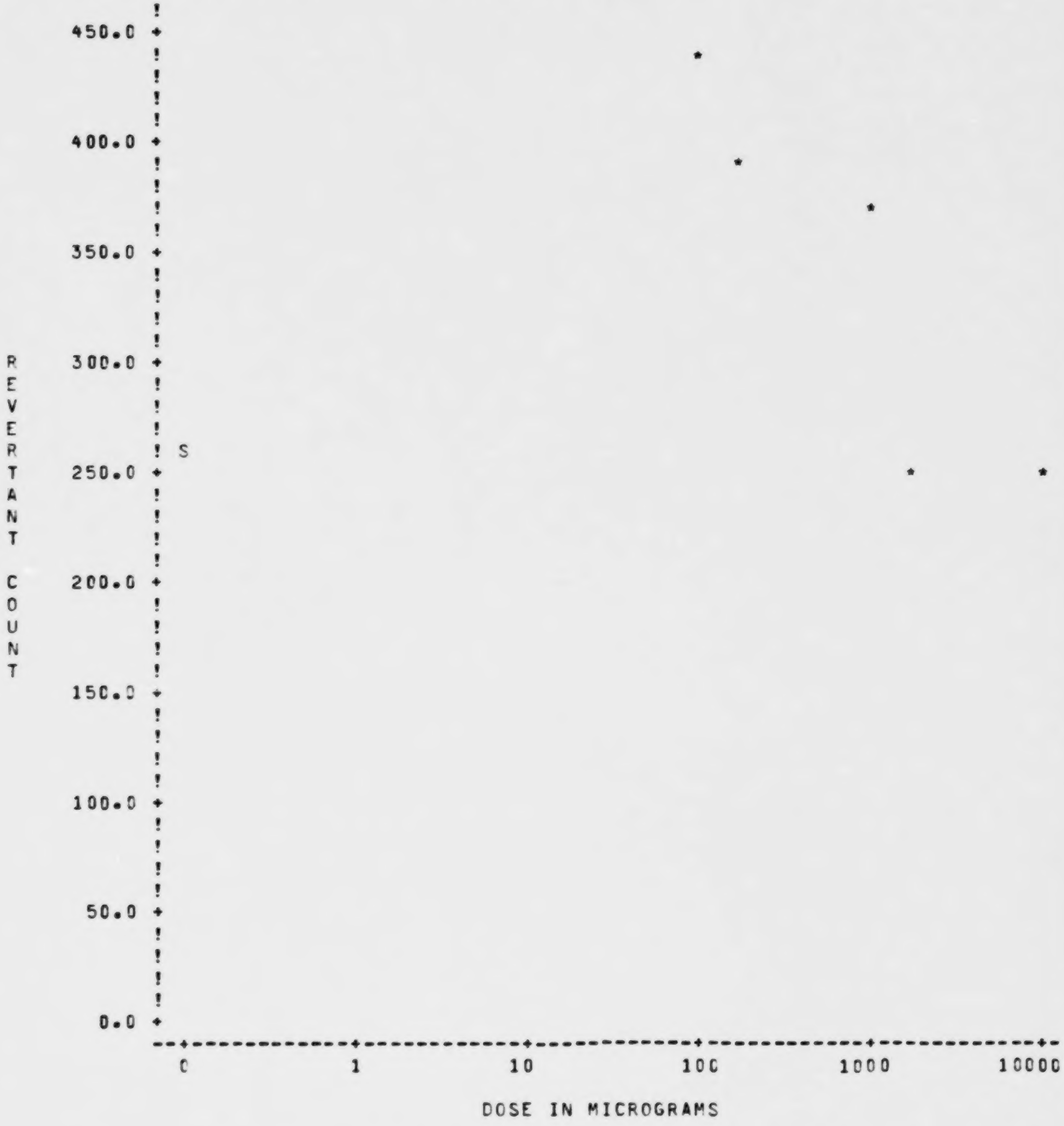
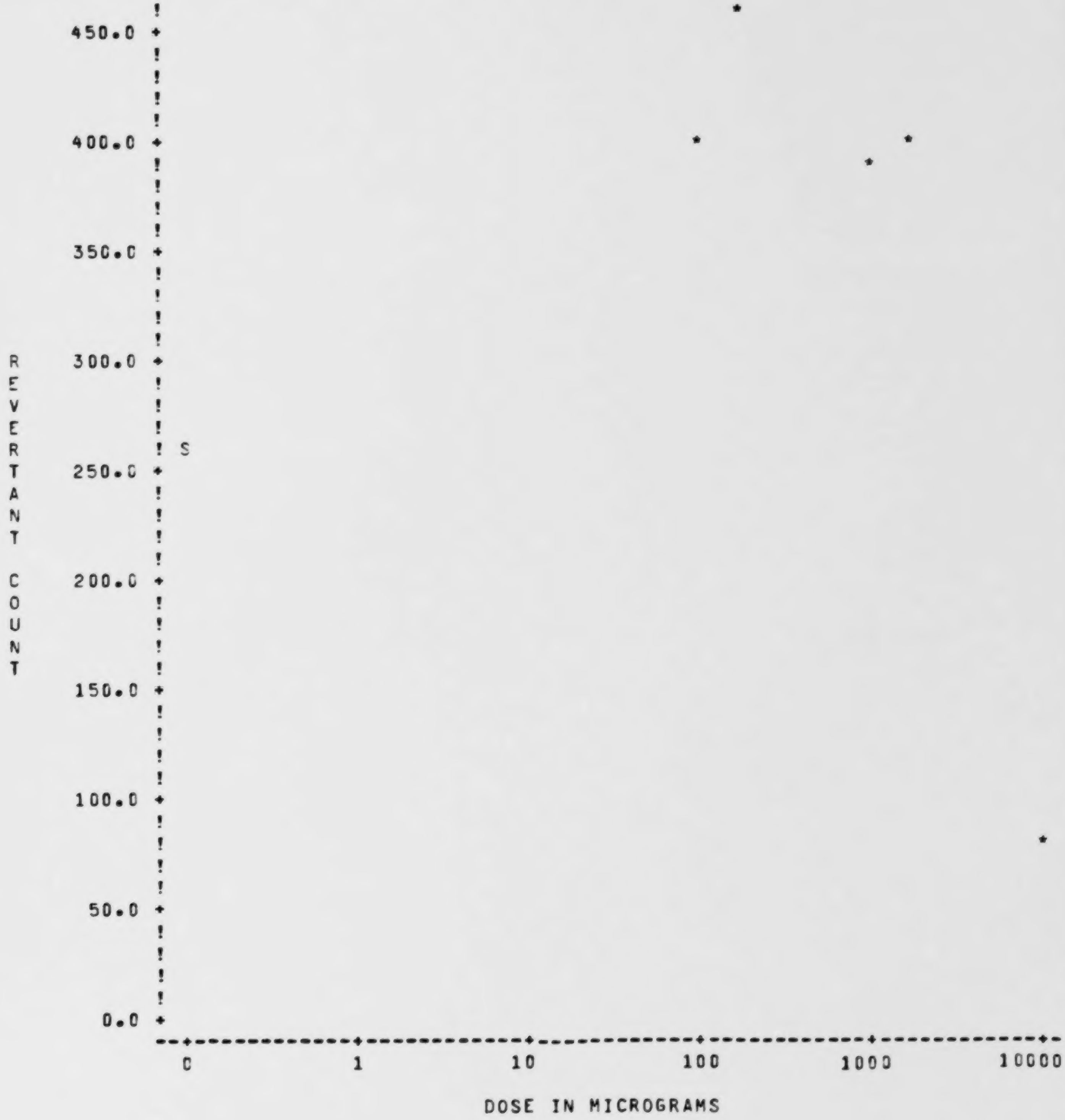

```
       S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=100   DATE=032883   ACTIV=    ACT%=05

          PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



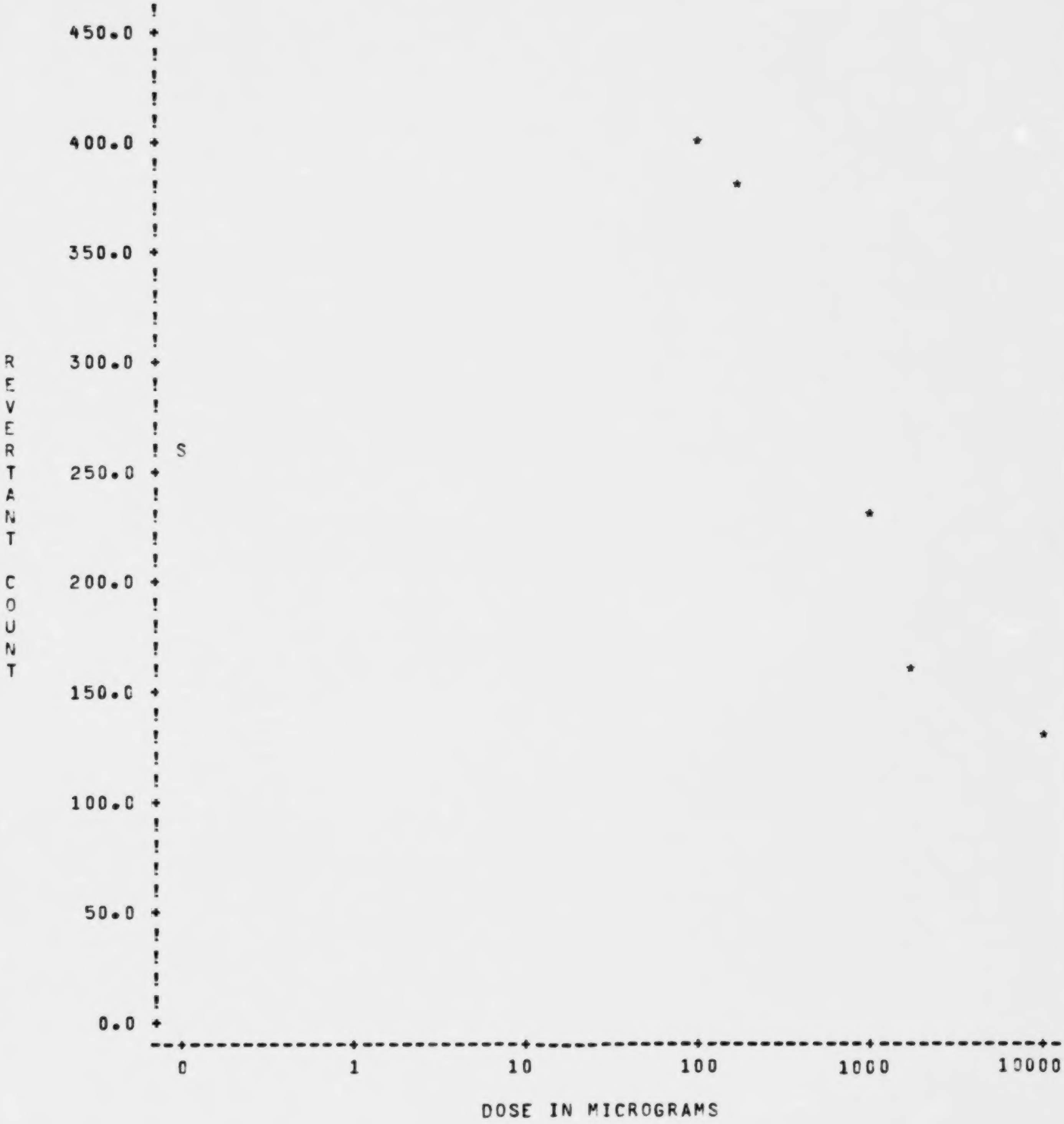
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=100   DATE=032883   ACTIV=CSD002   ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SFIND
```



TOXICITY OF NB - TA100

```
T O X I C I T Y                                   CONTRACT NO.: 191482
EXP DATE: 032683     CHEMICAL: NB                 ACTIVATION:
TEST TYPE: 05        STRAIN: TA100                BATCH: C273
DILUTION=    :       PLATED=                      COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE      PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV         VR    TOX
POSITIVE  LEVEL     COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99       0.00    256        174        360        263.3      93.2          1.0
           100.00    257        243          0        166.7     144.5          0.6
           333.00    367        302          0        223.0     195.8          0.8
          1000.00    151        218        176        181.7      33.9          0.7
          3333.00    179        230        154        187.7      38.7          0.7
         10000.00          9          9          9                                    *

T O X I C I T Y                                   CONTRACT NO.: 191482
EXP DATE: 032883     CHEMICAL: NB                 ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA100                BATCH: C273
DILUTION=  1: 20     PLATED= 100                  COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE      PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV         VR    TOX
POSITIVE  LEVEL     COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99       0.00    256        174        360        263.3      93.2          1.0
           100.00    392        379        431        400.7      27.1          1.5
           333.00    470        300        355        375.0      86.7          1.4
          1000.00    339        184        166        229.7      95.1          0.9
          3333.00    194          6        273        157.7     137.2          0.6
         10000.00    342         13         46        133.7     181.2          0.5    *
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
     CON=191482   CHEM=NB   STRAIN=100   DATE=032883   ACTIV=      ACT%=05

               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
           !
     275.0 +
           !
           ! S
           !
     250.0 +
           !
           !
           !
     225.0 +                                 *
           !
           !
           !
     200.0 +
           !
R          !                                           *
E          !                                         *
V    175.0 +
E          !                               *
R          !
T          !
A    150.0 +
N          !
T          !
           !
C    125.0 +
O          !
U          !
N          !
T    100.0 +
           !
           !
           !
      75.0 +
           !
           !
           !
      50.0 +
           !
           !
           !
      25.0 +
           !
           !
           !
       0.0 +
           --+---------+---------+---------+---------+---------+-
             0         1        10        100       1000     10000

                            DOSE IN MICROGRAMS

NOTE:     1 OBS HAD MISSING VALUES OR WERE OUT OF RANGE
```

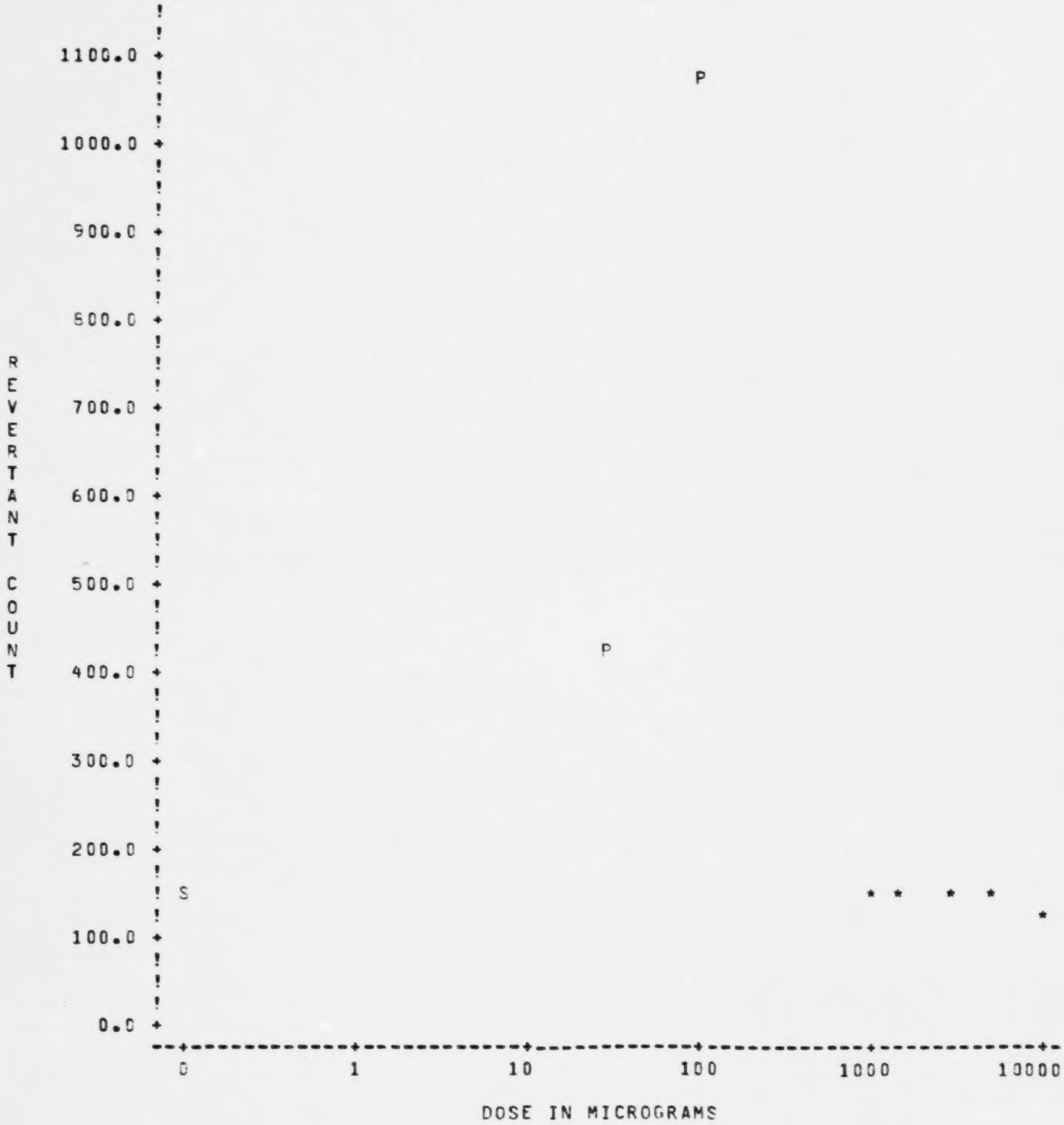
```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NB   STRAIN=100   DATE=032883   ACTIV=CSD002   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF MC - TA97

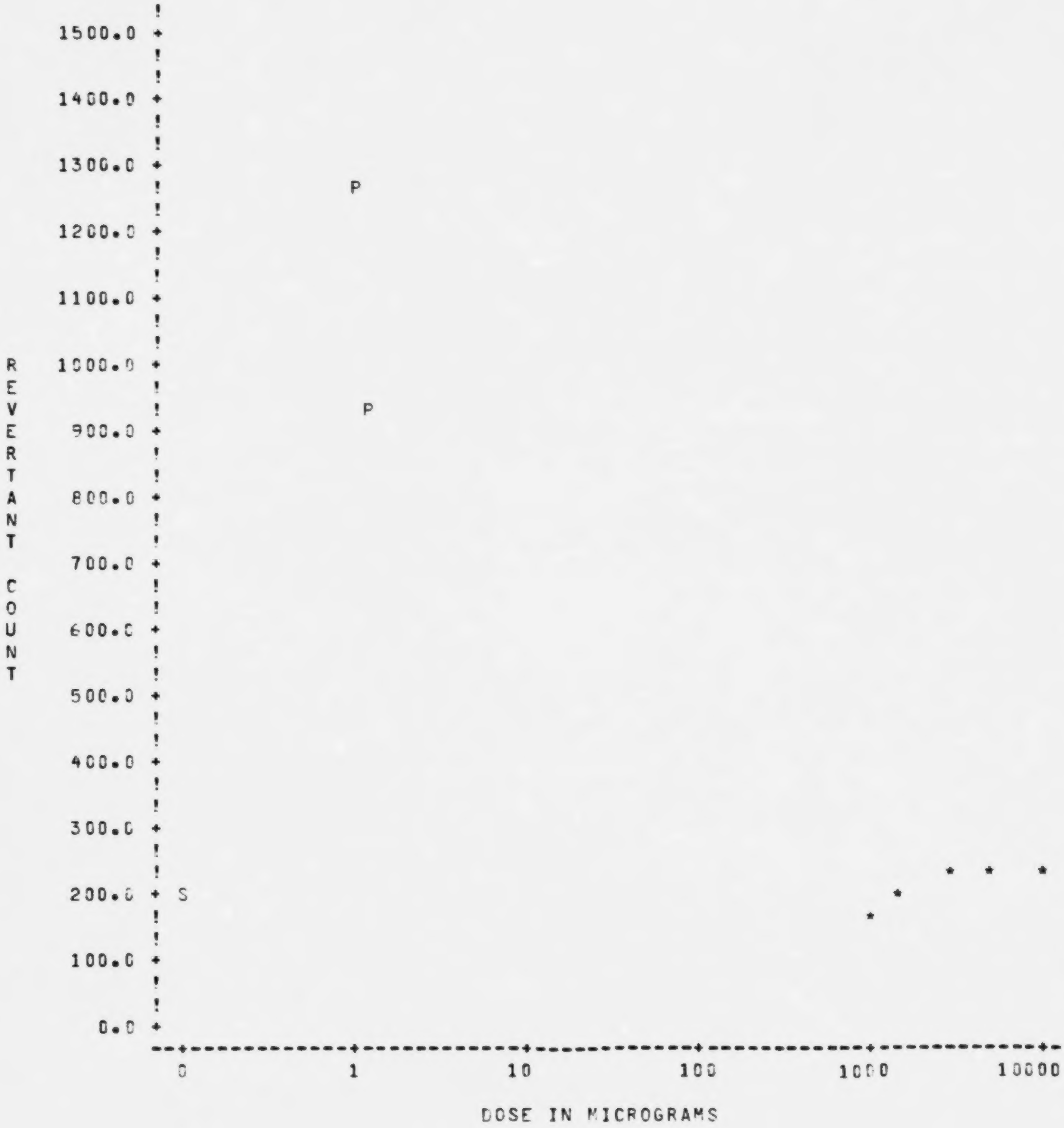
```
M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 031883     CHEMICAL: MC            ACTIVATION:
TEST TYPE: 05        STRAIN: TA97            BATCH: C173
DILUTION=   :        PLATED=                 COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     163       144       160      155.7     10.2     A    1.0
 P1 02     50.00     409       352       517      426.0     83.8     A    2.7
 P2 02    100.00    1241      1123       829     1064.3    212.2     A    6.8
         1000.00     129       145       178      150.7     25.0          1.0
         2500.00     151       162       147      153.3      7.8          1.0
         5000.00     150       132       153      145.0     11.4          0.9
         7500.00     177       125       129      143.7     28.9          0.9
        10000.00     119       138       132      129.7      9.7          0.8

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 031883     CHEMICAL: MC            ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97            BATCH: C173
DILUTION=  1: 20     PLATED= 100             COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     182       175       202      186.3     14.0     A    1.0
 P1 04      1.00    1010      1407      1401     1272.7    227.5     A    6.8
 P2 04      2.00     920       933       913      922.0     10.1     A    4.9
         1000.00     171       138       176      161.7     20.6          0.9
         2500.00     178       194       188      186.7      8.1          1.0
         5000.00     226       220       205      217.0     10.8          1.2
         7500.00     217       223       220      220.0      3.0          1.2
        10000.00     230       220       216      222.0      7.2          1.2

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 031883     CHEMICAL: MC            ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97            BATCH: C173
DILUTION=  1: 20     PLATED= 100             COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT PG   COUNT     COUNT

 S1 99      0.00     227       202       162      197.0     32.8     A    1.0
 P1 04      0.50     908      1001       924      944.3     49.7     A    4.8
 P2 04      1.00    1505      1356      1454     1438.3     75.7     A    7.3
         1000.00     219       244       190      217.7     27.0          1.1
         2500.00     226       205       215      215.3     10.5          1.1
         5000.00     194       220       233      215.7     19.9          1.1
         7500.00     205       244       245      231.3     22.8          1.2
        10000.00     177       197       201      191.7     12.9          1.0
```

```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=MC   STRAIN=97   DATE=031883   ACTIV=    ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

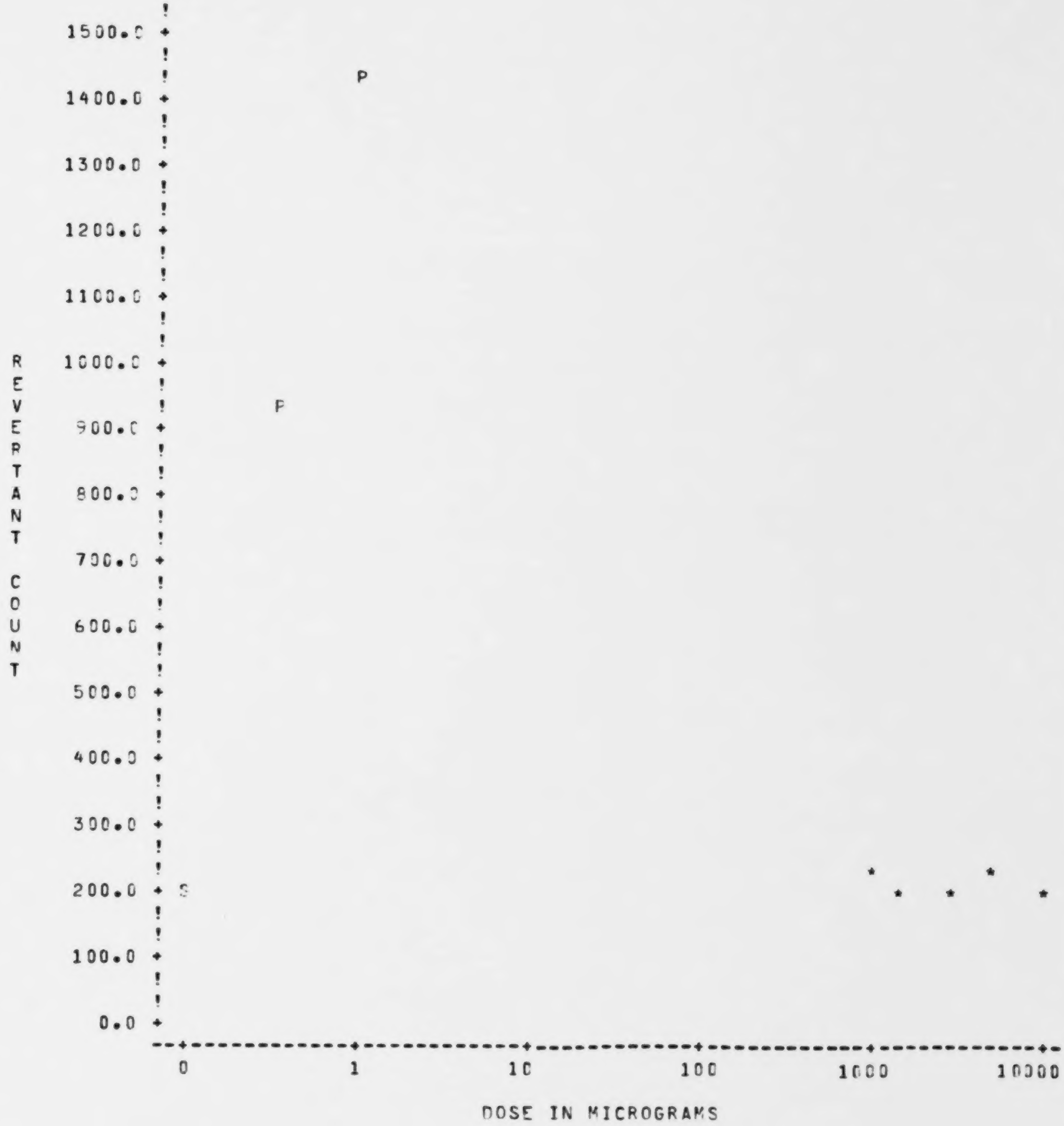


S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482 CHEM=MC STRAIN=97 DATE=031883 ACTIV=CSD002 ACT%=05

PLOT OF AVGCOUNT*DOSE SYMBOL IS VALUE OF SPIND



```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=151482    CHEM=MC    STRAIN=97    DATE=031883    ACTIV=HEPA01    ACT%=05

PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```

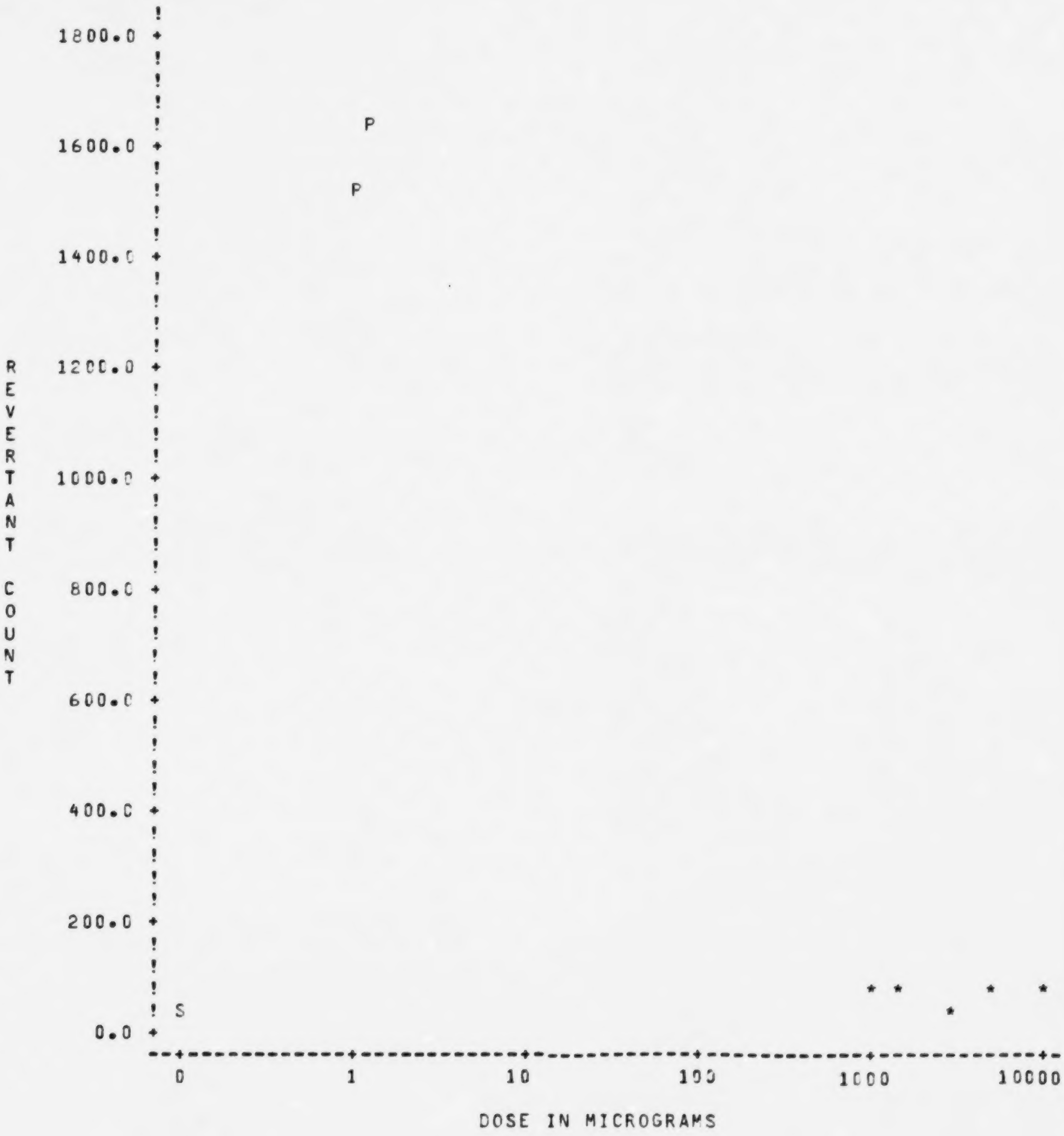


MUTAGENICITY OF MC - TA98

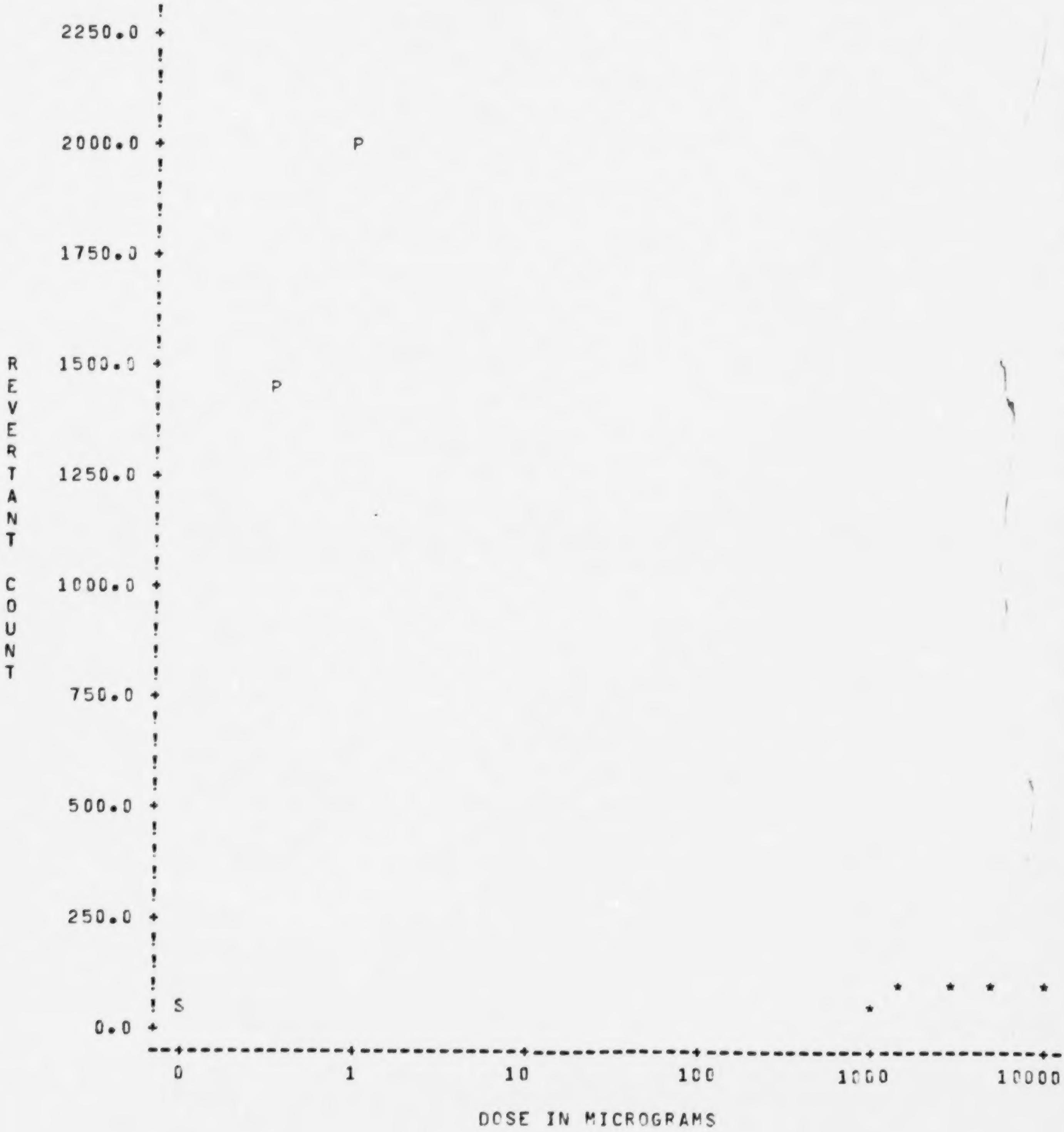
```
M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 031883    CHEMICAL: MC              ACTIVATION:
TEST TYPE: 05       STRAIN: TA98              BATCH: C173
DILUTION=   :       PLATED=                   COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     27        26        22        25.0       2.6    A    1.0
 P1 03      1.00    235       160       172       189.0      40.3    A    7.6
 P2 03      2.00    259       289       344       297.3      43.1    A   11.9
         1000.00     53        55        59        55.7       3.1         2.2   *
         2500.00     53        74        57        61.3      11.2         2.5
         5000.00     47        70        56        57.7      11.6         2.3
         7500.00     49        61        59        56.3       6.4         2.3
        10000.00     54        59        56        56.3       2.5         2.3

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 031883    CHEMICAL: MC              ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98              BATCH: C173
DILUTION=  1: 20    PLATED= 100               COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     53        31        39        41.0      11.1   NA    1.0
 P1 04      1.00   1608      1358      1559      1508.3     132.5    A   36.8
 P2 04      2.00   1663      1663      1634      1653.3      16.7    A   40.3
         1000.00     72        84        96        84.0      12.0         2.0   *
         2500.00     94        92        73        86.3      11.6         2.1
         5000.00     45        14        24        27.7      15.8         0.7
         7500.00     84        94        88        88.7       5.0         2.2
        10000.00     67        87        88        80.7      11.8         2.0

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 031883    CHEMICAL: MC              ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98              BATCH: C173
DILUTION=  1: 20    PLATED= 100               COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     30        42        28        33.3       7.6    A    1.0
 P1 04      0.50   1252      1634      1513      1466.3     195.2    A   44.0
 P2 04      1.00   1870      2031      2109      2003.3     121.9    A   60.2
         1000.00     69        60        58        62.3       5.9         1.9
         2500.00     66        83        81        76.7       9.3         2.3   *
         5000.00     69       107        70        82.0      21.7         2.5
         7500.00     94        77        85        85.3       8.5         2.6
        10000.00    114        81        98        97.7      16.5         2.9
```

```
           S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
      CON=191482   CHEM=MC   STRAIN=98   DATE=031883   ACTIV=    ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

          !
          !
    330.0 +
          !
          !
          !
    300.0 +              P
          !
          !
          !
    270.0 +
          !
          !
          !
    240.0 +
          !
R         !
E         !
V   210.0 +
E         !
R         !
T         !             P
A   180.0 +
N         !
T         !
          !
C   150.0 +
O         !
U         !
N         !
T   120.0 +
          !
          !
          !
     90.0 +
          !
          !
          !
     60.0 +                                                    *   *  *  *
          !                                                  *
          !
          !
     30.0 +
          ! S
          !
          !
      0.0 +
          --+-----------+-----------+------------+-----------+-----------+-
            0           1          10           100        1000       10000

                                 DOSE IN MICROGRAMS
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191462   CHEM=MC   STRAIN=98   DATE=031883   ACTIV=CSD002   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=MC   STRAIN=98   DATE=031883   ACTIV=HEPA01   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

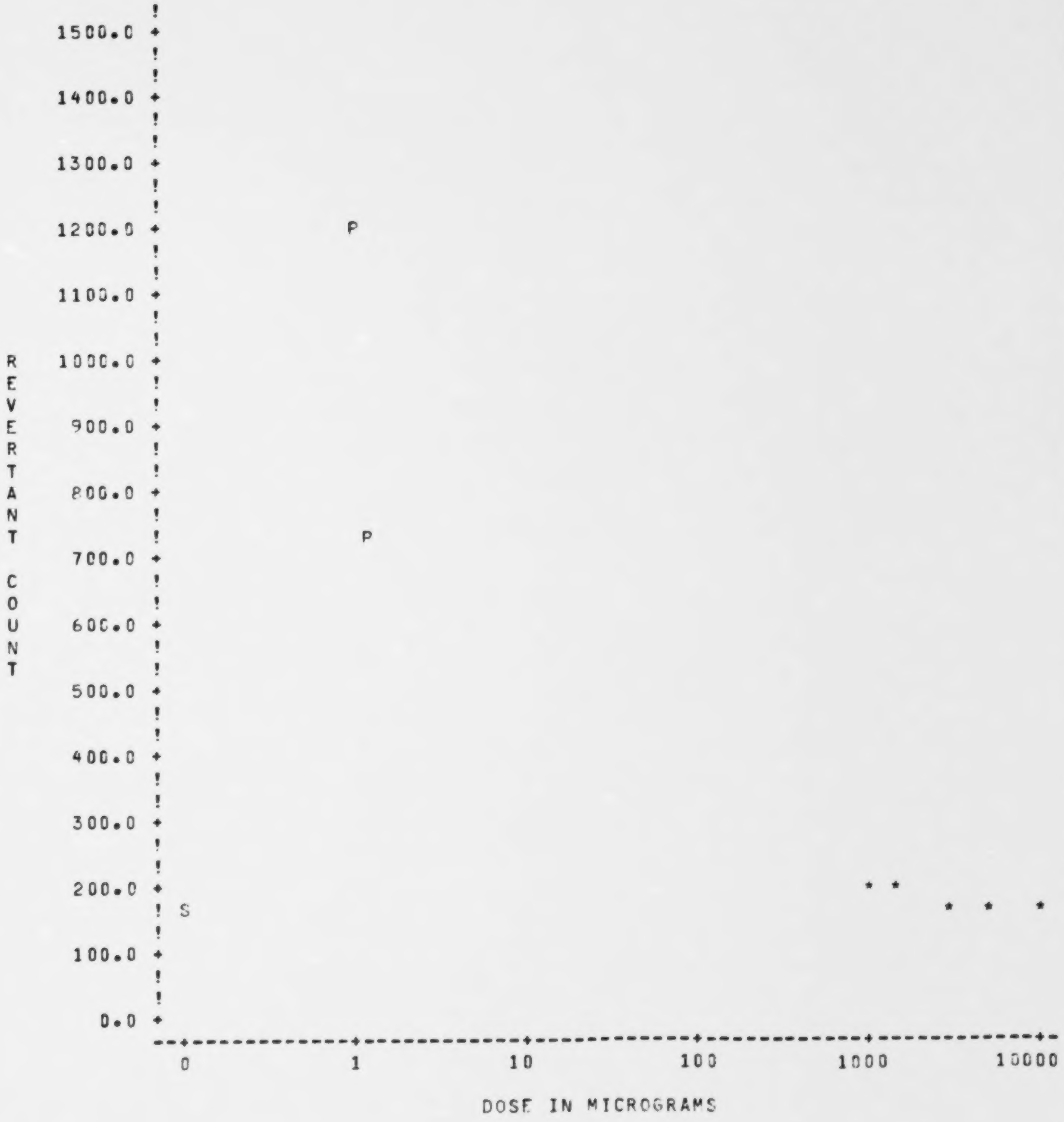


MUTAGENICITY OF MC - TA100

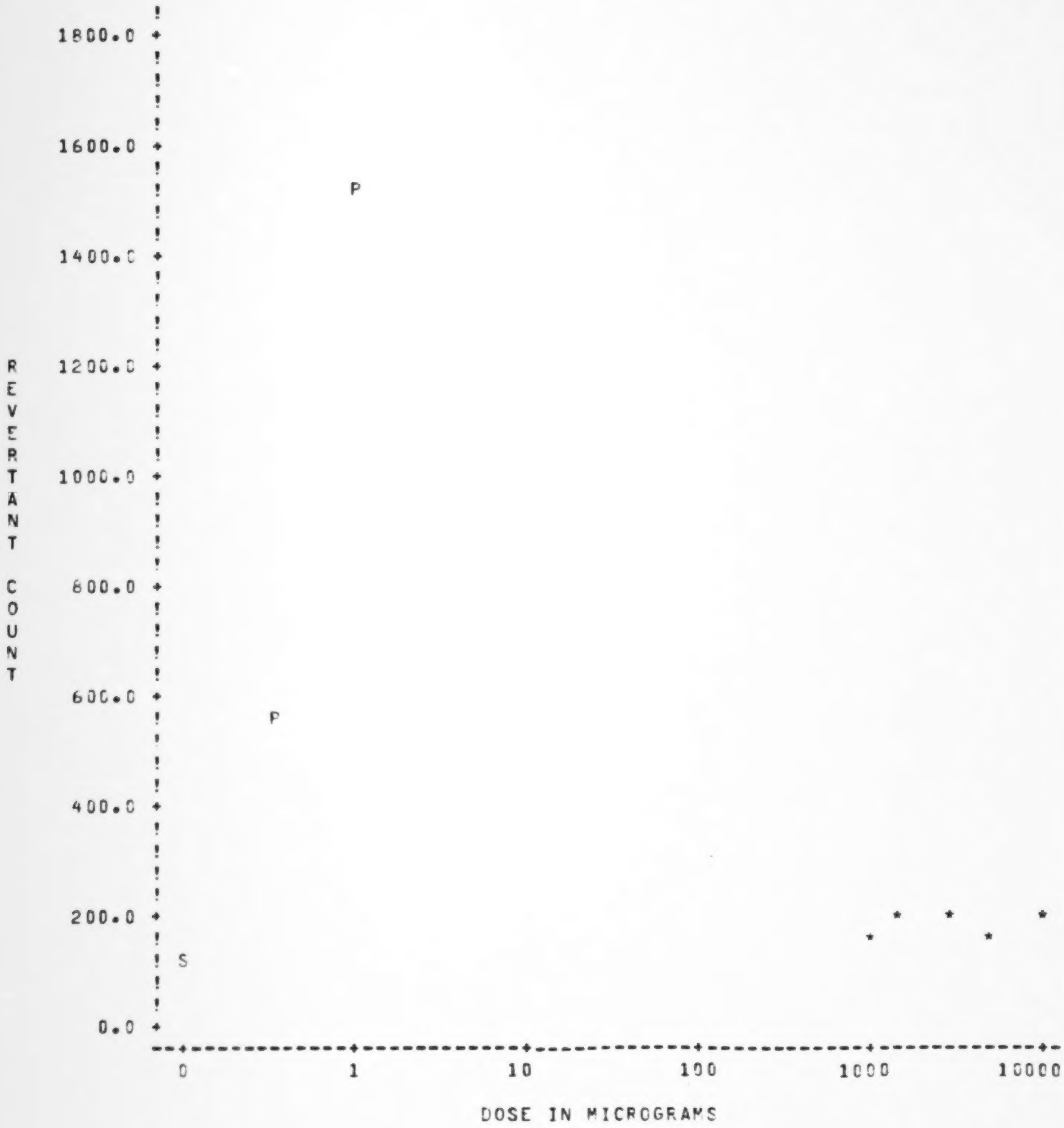
```
MUTAGENICITY                                CONTRACT NO.: 191482
EXP DATE: 031883     CHEMICAL: MC           ACTIVATION:
TEST TYPE: 05        STRAIN: TA100          BATCH: C173
DILUTION=   :        PLATED=                COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     128       178       163      156.3      25.7    A   1.0
 P1 01      1.00     794       724       544      687.3     129.0    A   4.4
 P2 01      2.00     703       399       601      567.7     154.7    A   3.6
         1000.00     157       125       137      139.7      16.2        0.9
         2500.00     152       130       108      130.0      22.0        0.8
         5000.00     153       145       119      139.0      17.8        0.9
         7500.00     131       119       123      124.3       6.1        0.8
        10000.00     151       150       163      154.7       7.2        1.0

MUTAGENICITY                                CONTRACT NO.: 191482
EXP DATE: 031883     CHEMICAL: MC           ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA100          BATCH: C173
DILUTION=  1: 20     PLATED= 100            COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     156       166       149      157.0       8.5    A   1.0
 P1 04      1.00    1077      1226      1280     1194.3     105.1    A   7.6
 P2 04      2.00     786       722       683      730.3      52.0    A   4.7
         1000.00     186       199       182      189.0       8.9        1.2
         2500.00     245       160       157      187.3      50.0        1.2
         5000.00     150       164       156      156.7       7.0        1.0
         7500.00     167       174       175      172.0       4.4        1.1
        10000.00     152       149       179      160.0      16.5        1.0

MUTAGENICITY                                CONTRACT NO.: 191482
EXP DATE: 031883     CHEMICAL: MC           ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA100          BATCH: C173
DILUTION=  1: 20     PLATED= 100            COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     133       136       134      134.3       1.5    A   1.0
 P1 04      0.50     594       569       484      549.0      57.7    A   4.1
 P2 04      1.00    1334      1541      1733     1536.0     199.5    A  11.4
         1000.00     188       180       167      178.3      10.6        1.3
         2500.00     190       185       193      189.3       4.0        1.4
         5000.00     195       190       200      195.0       5.0        1.5
         7500.00     145       187       159      163.7      21.4        1.2
        10000.00     169       189       190      182.7      11.8        1.4
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
   CON=191482   CHEM=MC   STRAIN=100   DATE=031883   ACTIV=    ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

         !
   900.0 +
         !
         !
         !
         !
   800.0 +
         !
         !
         !
         !
   700.0 +
         !           P
         !
         !
         !
R  600.0 +
E        !
V        !            P
E        !
R        !
T  500.0 +
A        !
N        !
T        !
         !
C  400.0 +
O        !
U        !
N        !
T        !
   300.0 +
         !
         !
         !
         !
   200.0 +
         !
         ! S                                                 *
         !                                         * *  *
         !                                                *
   100.0 +
         !
         !
         !
         !
     0.0 +
         --+---------+---------+---------+---------+---------+--
           0         1         10        100      1000     10000

                            DOSE IN MICROGRAMS
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=MC   STRAIN=100   DATE=031883   ACTIV=CSD002   ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=MC   STRAIN=100   DATE=031883   ACTIV=HEPA01   ACT%=05

          PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

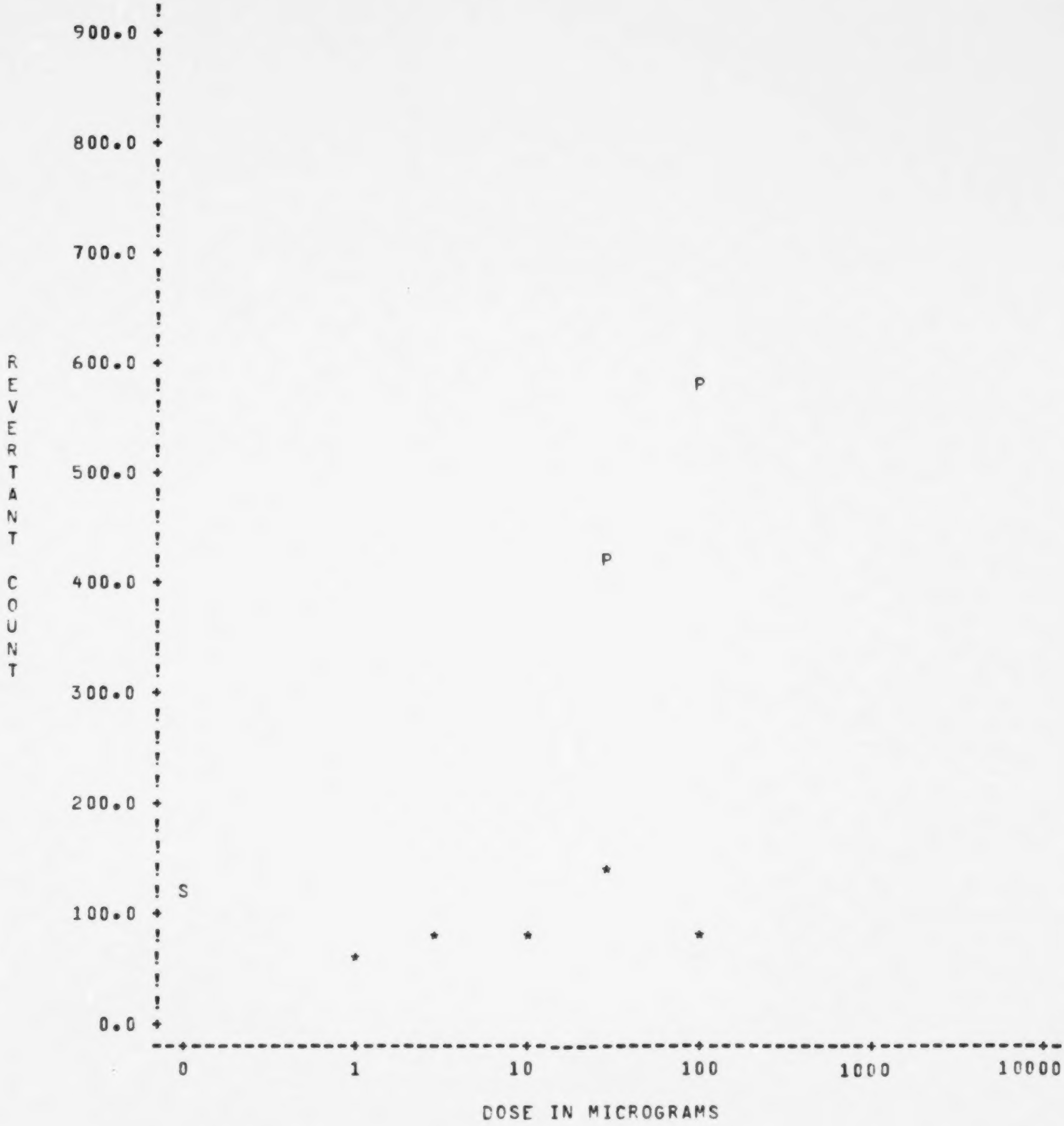


MUTAGENICITY OF FM - TA97

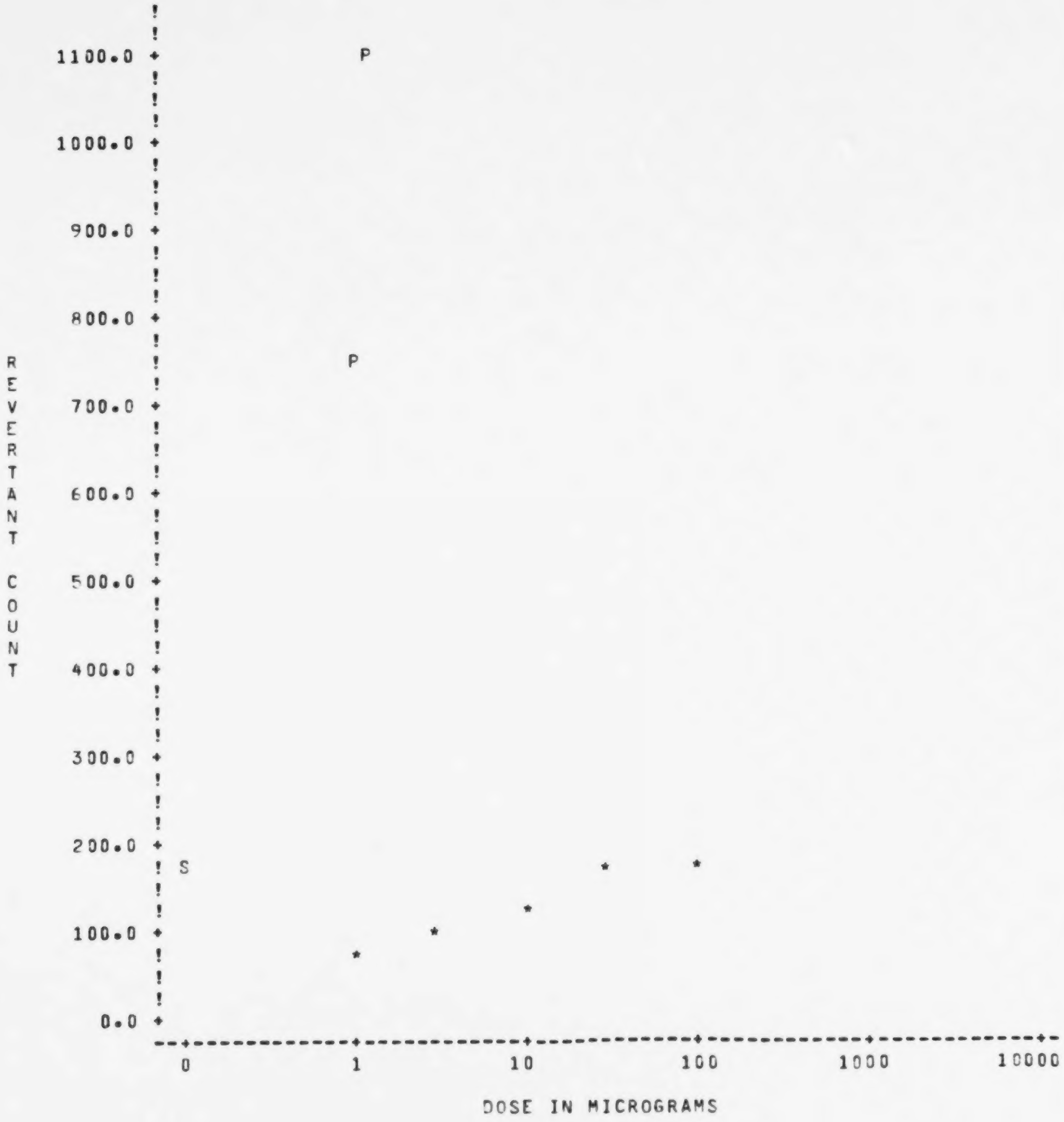
```
M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: FM                 ACTIVATION:
TEST TYPE: 05       STRAIN: TA97                 BATCH: D063
DILUTION=   :       PLATED=                      COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     153       111        89      117.7      32.5     A    1.0
 P1 02     50.00     396       503       331      410.0      86.9     A    3.5
 P2 02    100.00     577       566       595      579.3      14.6     A    4.9
            1.00      45        42        94       60.3      29.2          0.5
            5.00      78        91        95       88.0       8.9          0.7
           10.00      44        73        98       71.7      27.0          0.6
           50.00     106       153       137      132.0      23.9          1.1
          100.00      61        94        79       78.0      16.5          0.7

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: FM                 ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA97                 BATCH: D063
DILUTION=  1: 20    PLATED= 100                  COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     151       174       181      168.7      15.7     A    1.0
 P1 04      1.00     654       886       716      752.0     120.1     A    4.5
 P2 04      2.00     911      1217      1192     1106.7     169.9     A    6.6
            1.00      70        69        88       75.7      10.7          0.4
            5.00     106       113        98      105.7       7.5          0.6
           10.00      83       137       136      118.7      30.9          0.7
           50.00     185       143       195      174.3      27.6          1.0
          100.00     151       235       123      169.7      58.3          1.0

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: FM                 ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA97                 BATCH: D063
DILUTION=  1: 20    PLATED= 100                  COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     119       122       176      139.0      32.1     A    1.0
 P1 04      0.50     291       435       395      373.7      74.3     A    2.7
 P2 04      1.00     793       917       780      830.0      75.6     A    6.0
            1.00     111       122       150      127.7      20.1          0.9
            5.00     116       139       171      142.0      27.6          1.0
           10.00      92       116       177      128.3      43.8          0.9
           50.00     138       168       201      169.0      31.5          1.2
          100.00     168       196       157      173.7      20.1          1.2
```

```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=FM   STRAIN=97   DATE=040783   ACTIV=    ACT%=05
```

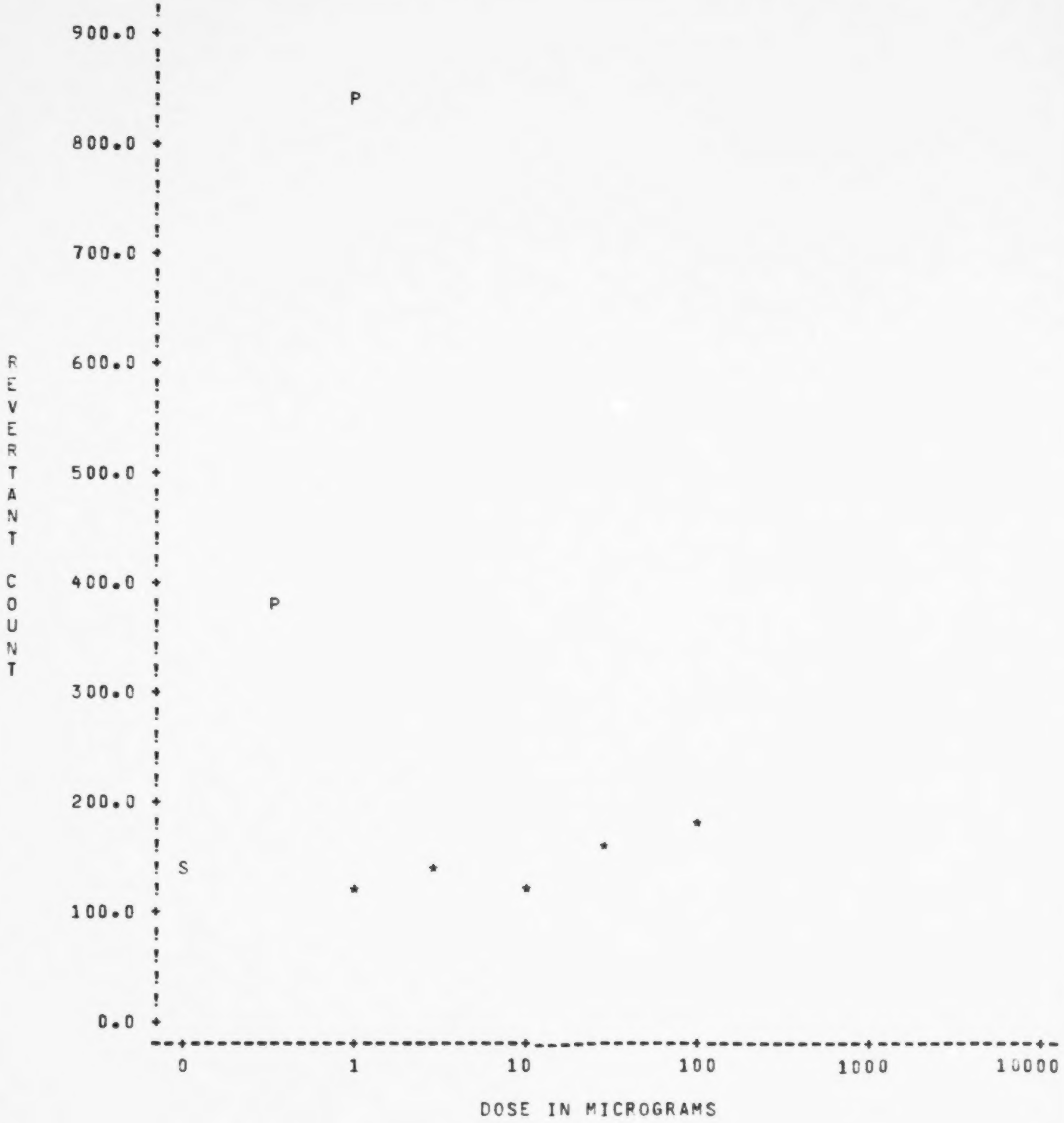
PLOT OF AVGCOUNT*DOSE   SYMBOL IS VALUE OF SPIND



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=FM   STRAIN=97   DATE=040783   ACTIV=CSD002   ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



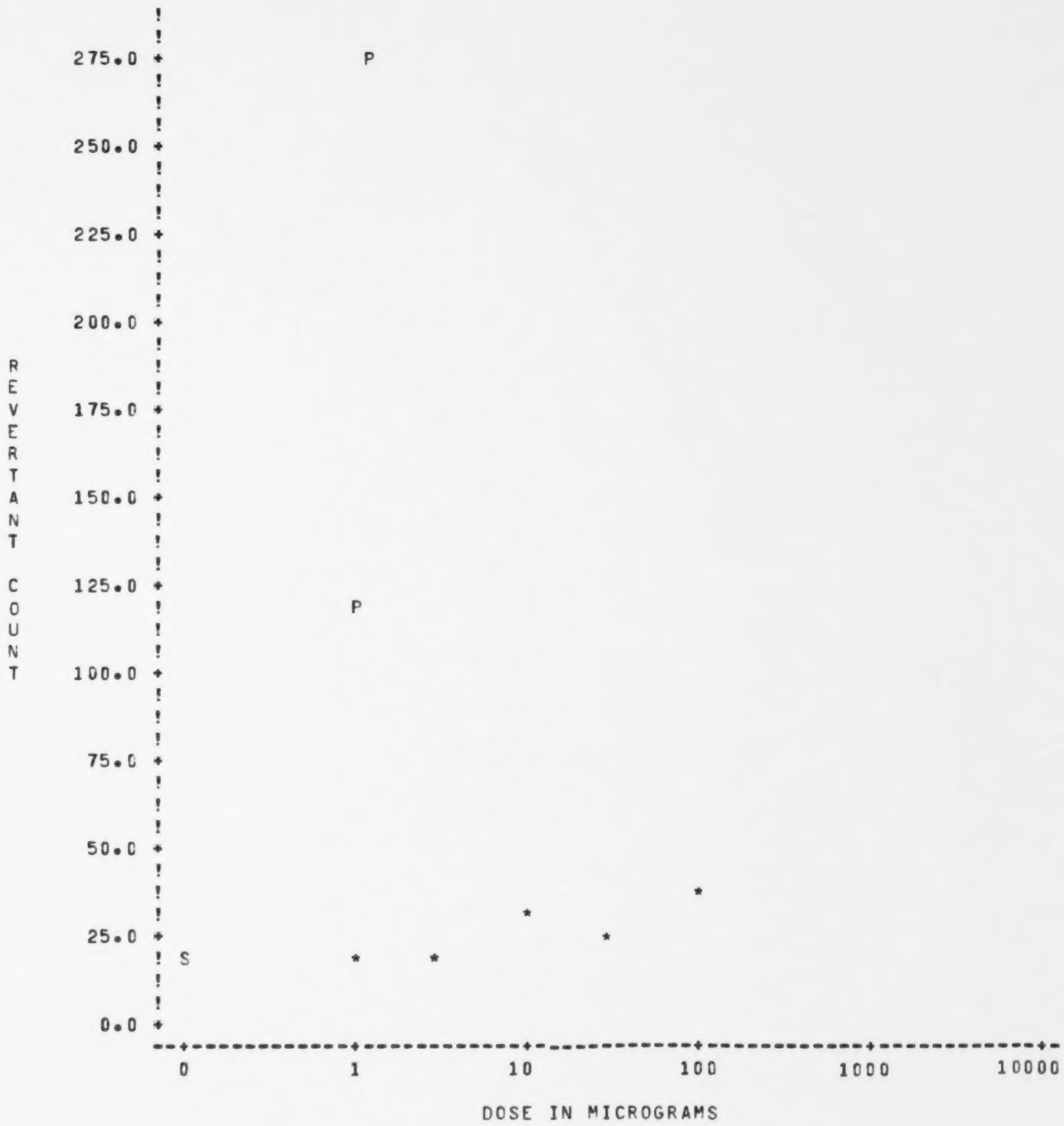
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=FM   STRAIN=97   DATE=040783   ACTIV=HEPA01   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



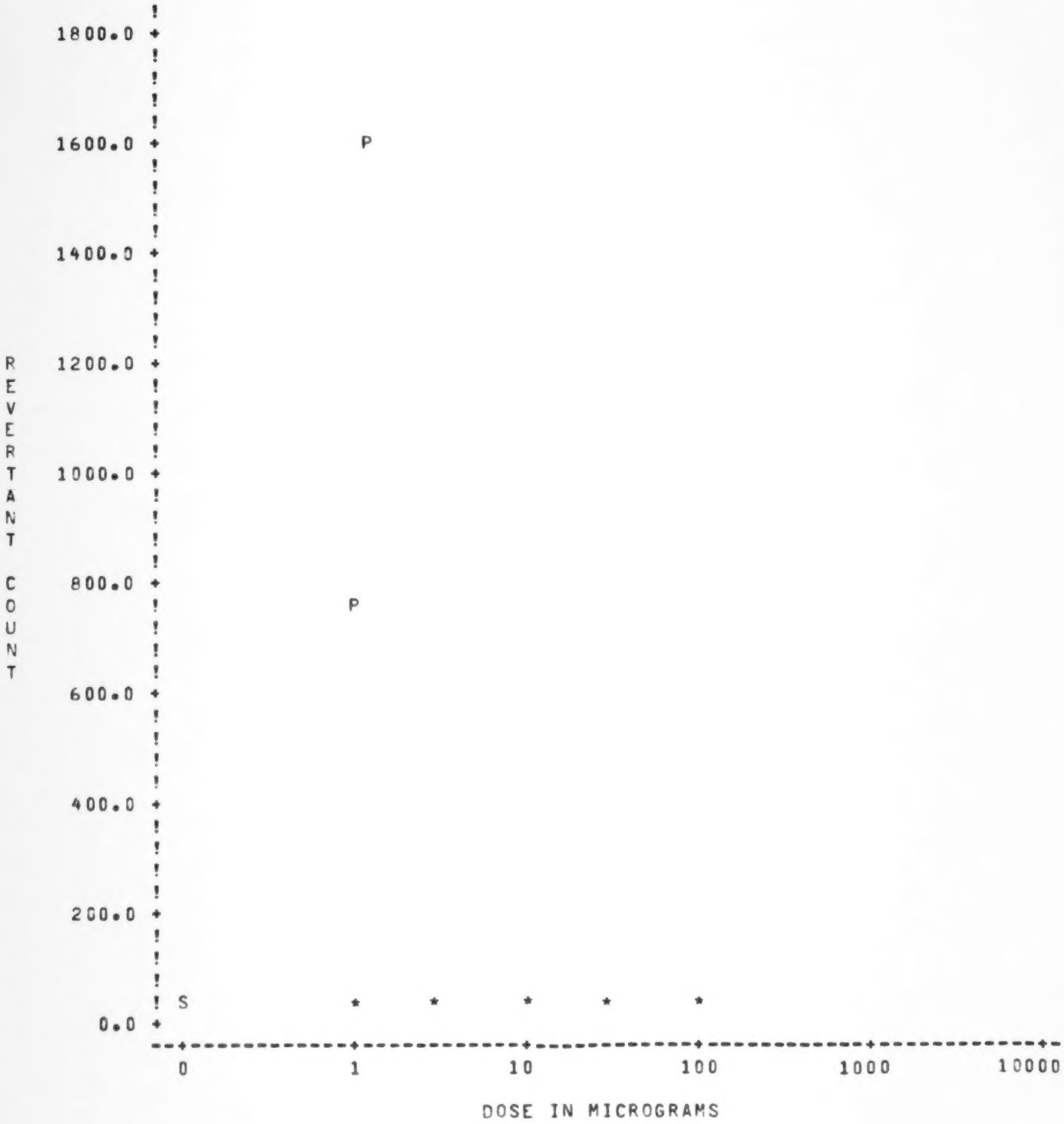
MUTAGENICITY OF FM - TA98

```
M U T A G E N I C I T Y                           CONTRACT NO.: 191482
EXP DATE: 040783     CHEMICAL: FM                 ACTIVATION:
TEST TYPE: 05        STRAIN: TA98                 BATCH: D063
DILUTION=    :       PLATED=                      COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00       19         19         17        18.3       1.2    A     1.0
 P1 03      1.00       82        139        142       121.0      33.8    A     6.6
 P2 03      2.00      222        341        267       276.7      60.1    A    15.1
            1.00       25         24         14        21.0       6.1          1.1
            5.00       16         19         23        19.3       3.5          1.1
           10.00       31         27         35        31.0       4.0          1.7
           50.00       24         27         22        24.3       2.5          1.3
          100.00       56         26         32        38.0      15.9          2.1    *

M U T A G E N I C I T Y                           CONTRACT NO.: 191482
EXP DATE: 040783     CHEMICAL: FM                 ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA98                 BATCH: D063
DILUTION=  1: 20     PLATED= 100                  COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00       22         32         23        25.7       5.5    A     1.0
 P1 04      1.00      793        866        679       779.3      94.2    A    30.3
 P2 04      2.00     1567       1696       1573      1612.0      72.8    A    62.7
            1.00       33         31         27        30.3       3.1          1.2
            5.00       23         33         29        28.3       5.0          1.1
           10.00       25         30         38        31.0       6.6          1.2
           50.00       35         44         30        36.3       7.1          1.4
          100.00       30         37         47        38.0       8.5          1.5

M U T A G E N I C I T Y                           CONTRACT NO.: 191482
EXP DATE: 040783     CHEMICAL: FM                 ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA98                 BATCH: D063
DILUTION=  1: 20     PLATED= 100                  COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00       41         35         26        34.0       7.5    A     1.0
 P1 04      0.50      198        262        238       232.7      32.3    A     6.8
 P2 04      1.00      747        808        672       742.3      68.1    A    21.8
            1.00       29         42         37        36.0       6.6          1.1
            5.00       22         33         42        32.3      10.0          1.0
           10.00       41         36         40        39.0       2.6          1.1
           50.00       35         26         36        32.3       5.5          1.0
          100.00       35         49         36        40.0       7.8          1.2
```

```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=151482   CHEM=FM   STRAIN=98   DATE=040783   ACTIV=     ACT%=05

           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=FM   STRAIN=98   DATE=040783   ACTIV=CSD002   ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
   CON=191482   CHEM=FM   STRAIN=98   DATE=040783   ACTIV=HEPA01   ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

          !
    900.0 +
          !
          !
          !
          !
    800.0 +
          !
          !
          !             P
          !
    700.0 +
          !
          !
          !
          !
R   600.0 +
E         !
V         !
E         !
R         !
T   500.0 +
A         !
N         !
T         !
          !
C   400.0 +
O         !
U         !
N         !
T         !
    300.0 +
          !
          !
          !       P
          !
    200.0 +
          !
          !
          !
          !
    100.0 +
          !
          !
          ! S           *    *      *    *      *
          !
      0.0 +
          --+-----------+-----------+-----------+-----------+-----------+-
            0           1          10          100        1000       10000

                                 DOSE IN MICROGRAMS
```

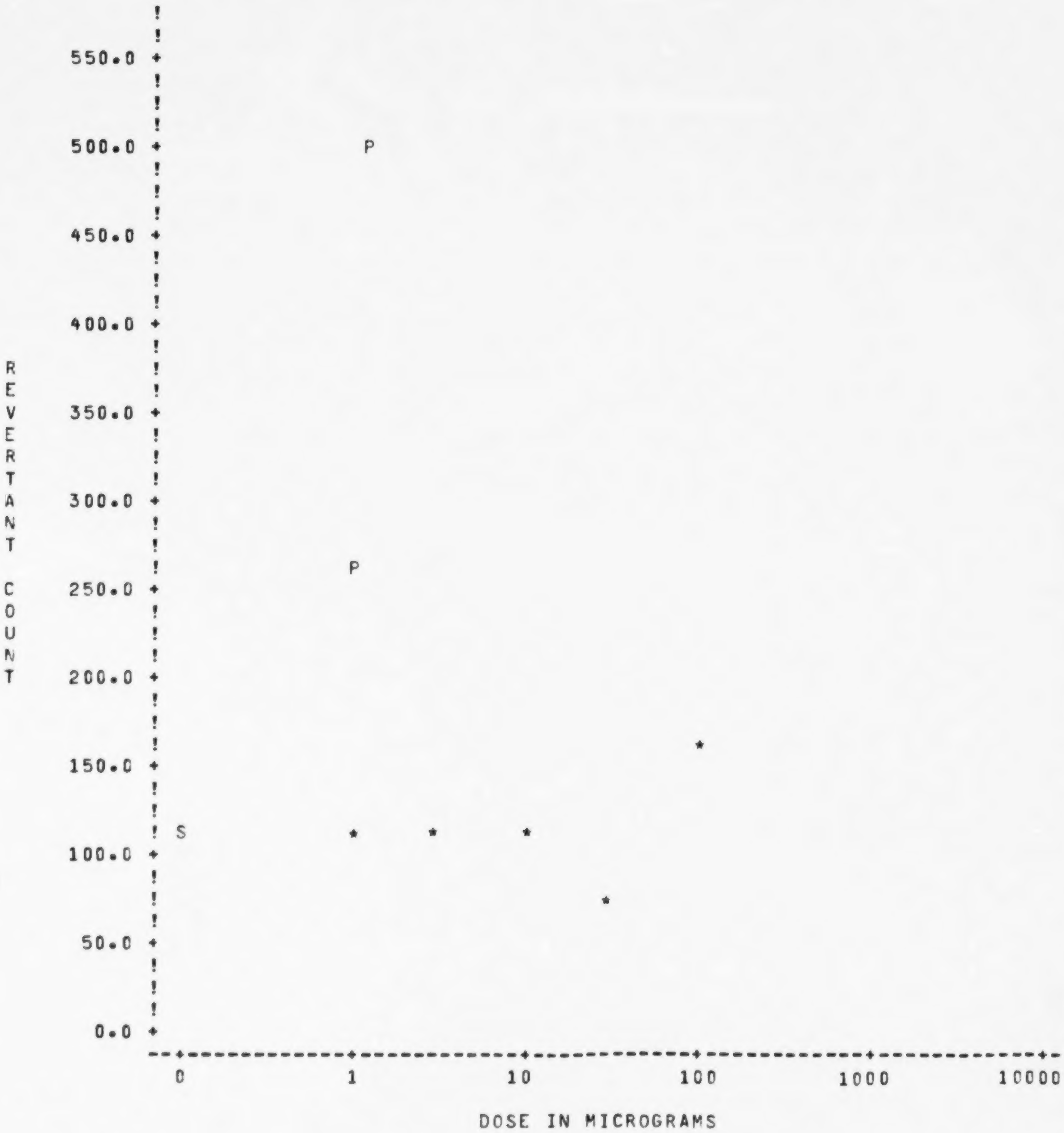
MUTAGENICITY OF FM - TA100

```
M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: FM          ACTIVATION:
TEST TYPE: 05       STRAIN: TA100         BATCH: D063
DILUTION=   :       PLATED=               COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99     0.00    122         92       114      109.3     15.5    A   1.0
 P1 01     1.00    278        284       239      267.0     24.4    A   2.4
 P2 01     2.00    587        493       406      495.3     90.5    A   4.5
           1.00    133        113        85      110.3     24.1        1.0
           5.00    137         71       115      107.7     33.6        1.0
          10.00    139        106        84      109.7     27.7        1.0
          50.00     81         80        74       78.3      3.8        0.7
         100.00    174        165       131      156.7     22.7        1.4
```

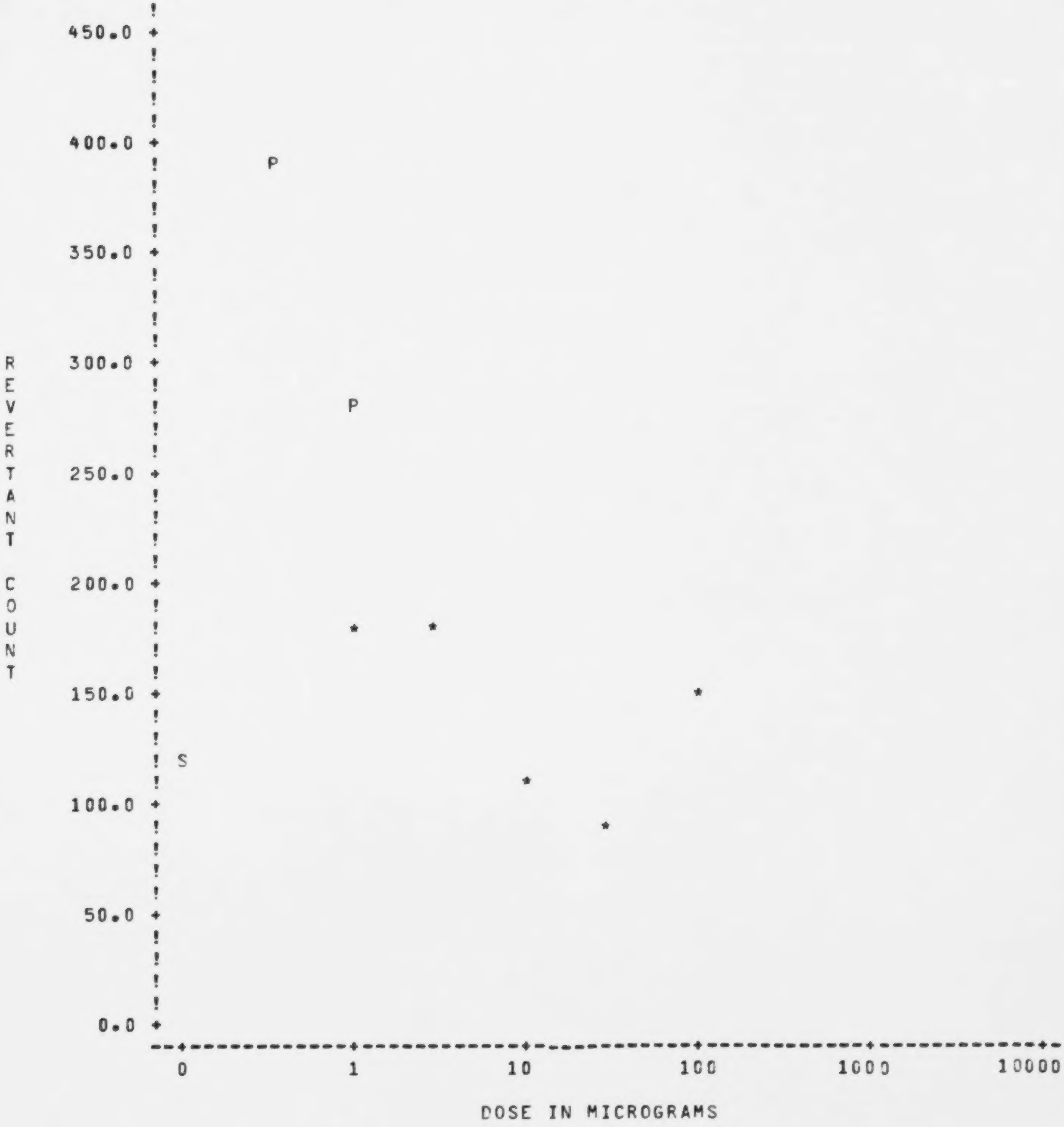
```
M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: FM          ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100         BATCH: D063
DILUTION=  1: 20    PLATED= 100           COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99     0.00    143        167       143      151.0     13.9    A   1.0
 P1 04     1.00    690        970       922      860.7    149.7    A   5.7
 P2 04     2.00   1506       1999      1720     1741.7    247.2    A  11.5
           1.00     83         89        83       85.0      3.5        0.6
           5.00     77         61        78       72.0      9.5        0.5
          10.00    124        106        93      107.7     15.6        0.7
          50.00    128        152       129      136.3     13.6        0.9
         100.00    233        174       133      180.0     50.3        1.2
```

```
M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: FM          ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100         BATCH: D063
DILUTION=  1: 20    PLATED= 100           COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99     0.00    130        120       111      120.3      9.5    A   1.0
 P1 04     0.50    302        417       458      392.3     80.9    A   3.3
 P2 04     1.00    236        231       367      278.0     77.1    A   2.3
           1.00    186        193       160      179.7     17.4        1.5
           5.00    196        190       151      179.0     24.4        1.5
          10.00    108        107       111      108.7      2.1        0.9
          50.00    138         68        75       93.7     38.6        0.8
         100.00    147        182       126      151.7     28.3        1.3
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=FM   STRAIN=100   DATE=040783   ACTIV=    ACT%=05

           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

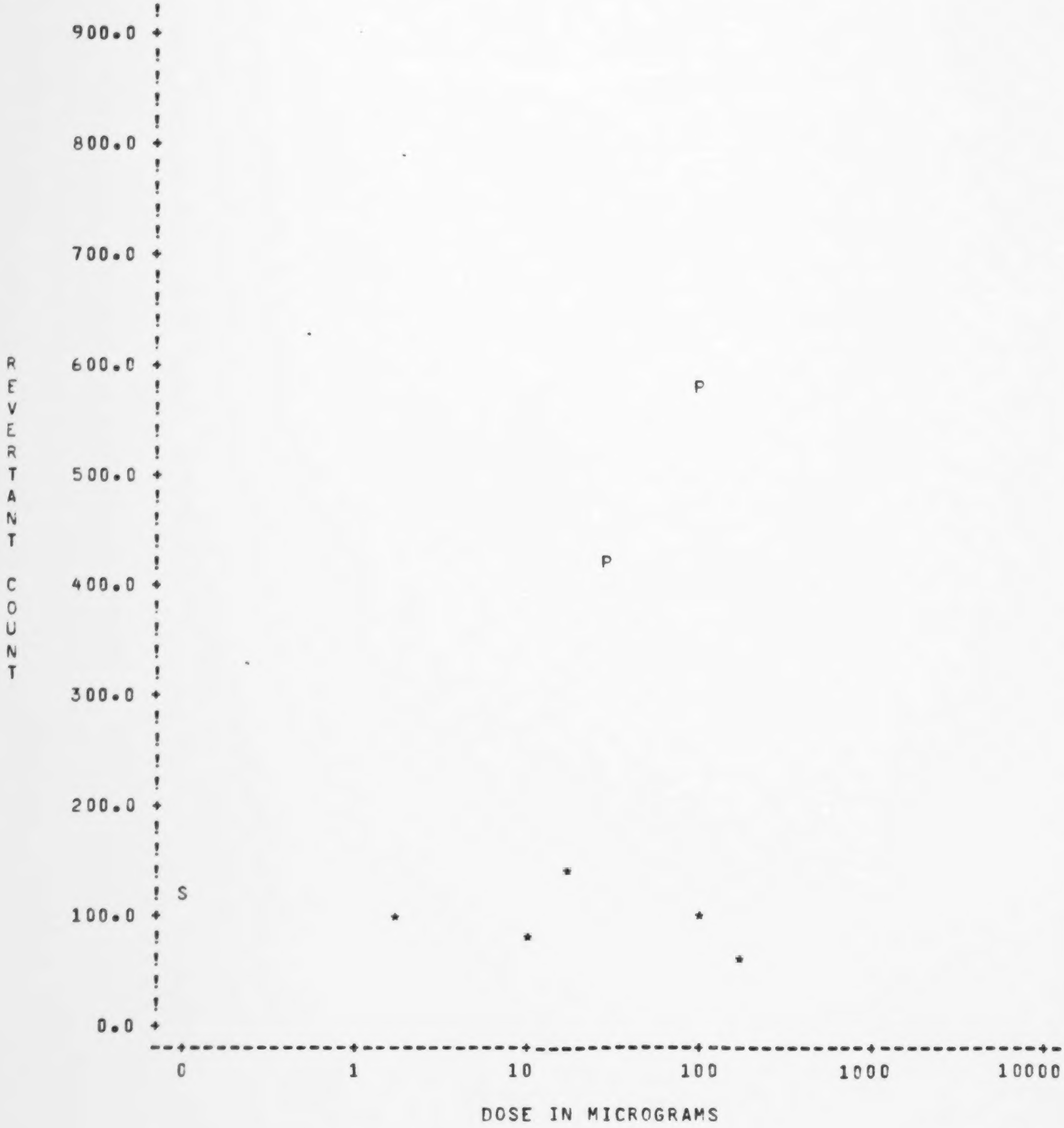


```
            S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=FM   STRAIN=100   DATE=040783   ACTIV=CSD002   ACT%=05

                   PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1800.0 +
           !               P
           !
           !
           !
    1600.0 +
           !
           !
           !
           !
    1400.0 +
           !
           !
           !
           !
R   1200.0 +
E          !
V          !
E          !
R          !
T   1000.0 +
A          !
N          !
T          !              P
           !
C    800.0 +
O          !
U          !
N          !
T          !
     600.0 +
           !
           !
           !
           !
     400.0 +
           !
           !
           !
           !
     200.0 +                                        *
           ! S
           !                           *     *
           !              *     *
           !
       0.0 +
           --+------------+------------+------------+------------+------------+-
             0            1           10           100         1000        10000

                                    DOSE IN MICROGRAMS
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=FM   STRAIN=100   DATE=040783   ACTIV=HEPA01   ACTX=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



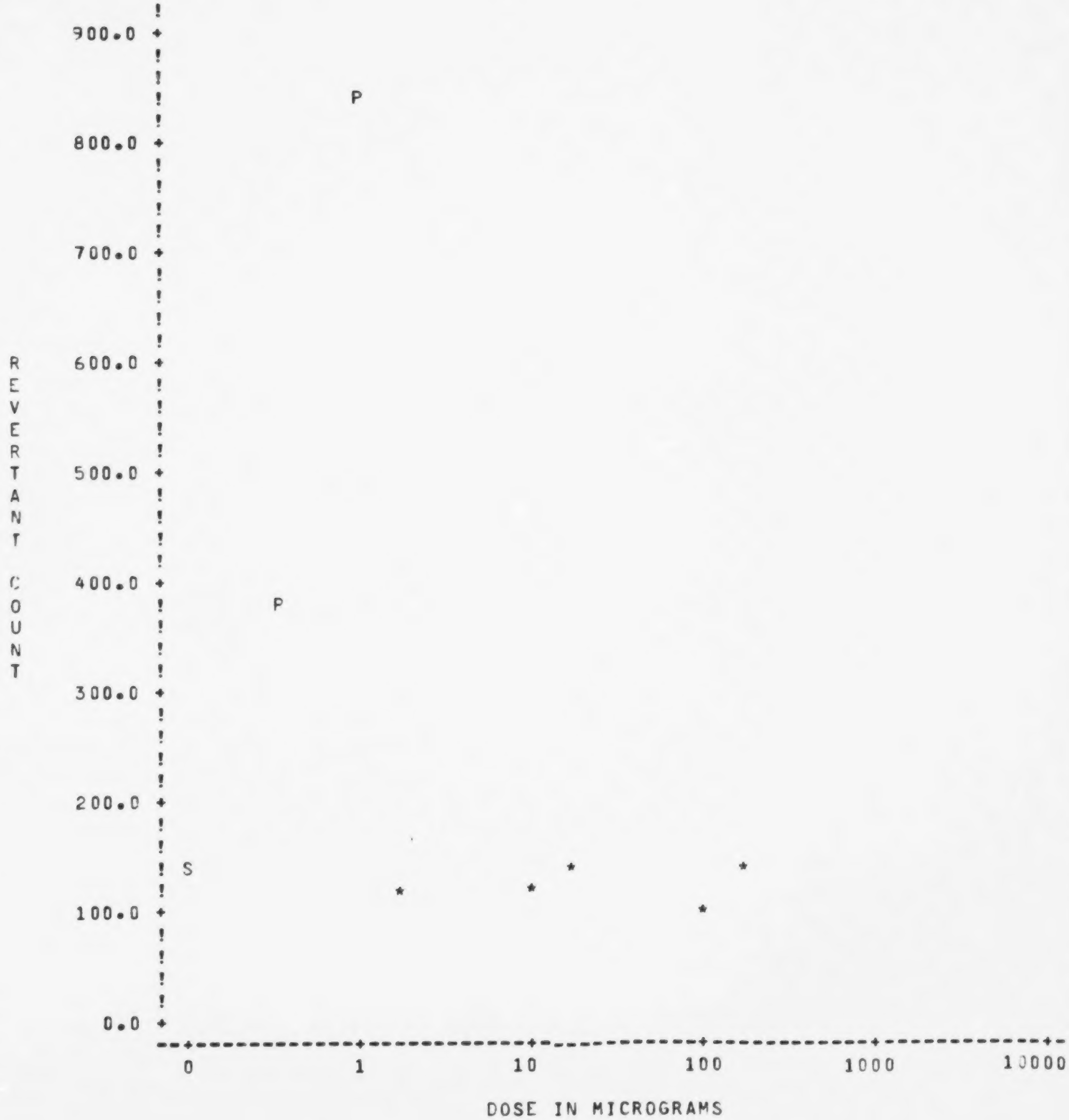
```
                        MUTAGENICITY OF TRC  - TA97

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040783     CHEMICAL: TRC               ACTIVATION:
TEST TYPE: 05        STRAIN: TA97                BATCH: D063
DILUTION=   :        PLATED=                     COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG   COUNT     COUNT

 S1 99      0.00    153        111         89        117.7     32.5     A    1.0
 P1 02     50.00    396        503        331        410.0     86.9     A    3.5
 P2 02    100.00    577        566        595        579.3     14.6     A    4.9
            3.00     84        120         91         98.3     19.1          0.8
           10.00     50         65        129         81.3     42.0          0.7
           33.00    131        149        127        135.7     11.7          1.2
          100.00    114         78        116        102.7     21.4          0.9
          333.00     36         78         75         63.0     23.4          0.5

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040783     CHEMICAL: TRC               ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97                BATCH: D063
DILUTION=  1: 20     PLATED= 100                 COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG   COUNT     COUNT

 S1 99      0.00    151        174        181        168.7     15.7     A    1.0
 P1 04      1.00    654        886        716        752.0    120.1     A    4.5
 P2 04      2.00    911       1217       1192       1106.7    169.9     A    6.6
            3.00    178        135         92        135.0     43.0          0.8
           10.00     98         91        141        110.0     27.1          0.7
           33.00    111        142        130        127.7     15.6          0.8
          100.00     64        128         96         96.0     32.0          0.6
          333.00    115        128         92        111.7     18.2          0.7

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040783     CHEMICAL: TRC               ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97                BATCH: D063
DILUTION=  1: 20     PLATED= 100                 COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG   COUNT     COUNT

 S1 99      0.00    119        122        176        139.0     32.1     A    1.0
 P1 04      0.50    291        435        395        373.7     74.3     A    2.7
 P2 04      1.00    793        917        780        830.0     75.6     A    6.0
            3.00    143        112        106        120.3     19.9          0.9
           10.00     81        143        152        125.3     38.7          0.9
           33.00    151        157        131        146.3     13.6          1.1
          100.00     89         98        132        106.3     22.7          0.8
          333.00    123        146        130        133.0     11.8          1.0
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=TRC   STRAIN=97   DATE=040783   ACTIV=    ACT%=05

            PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



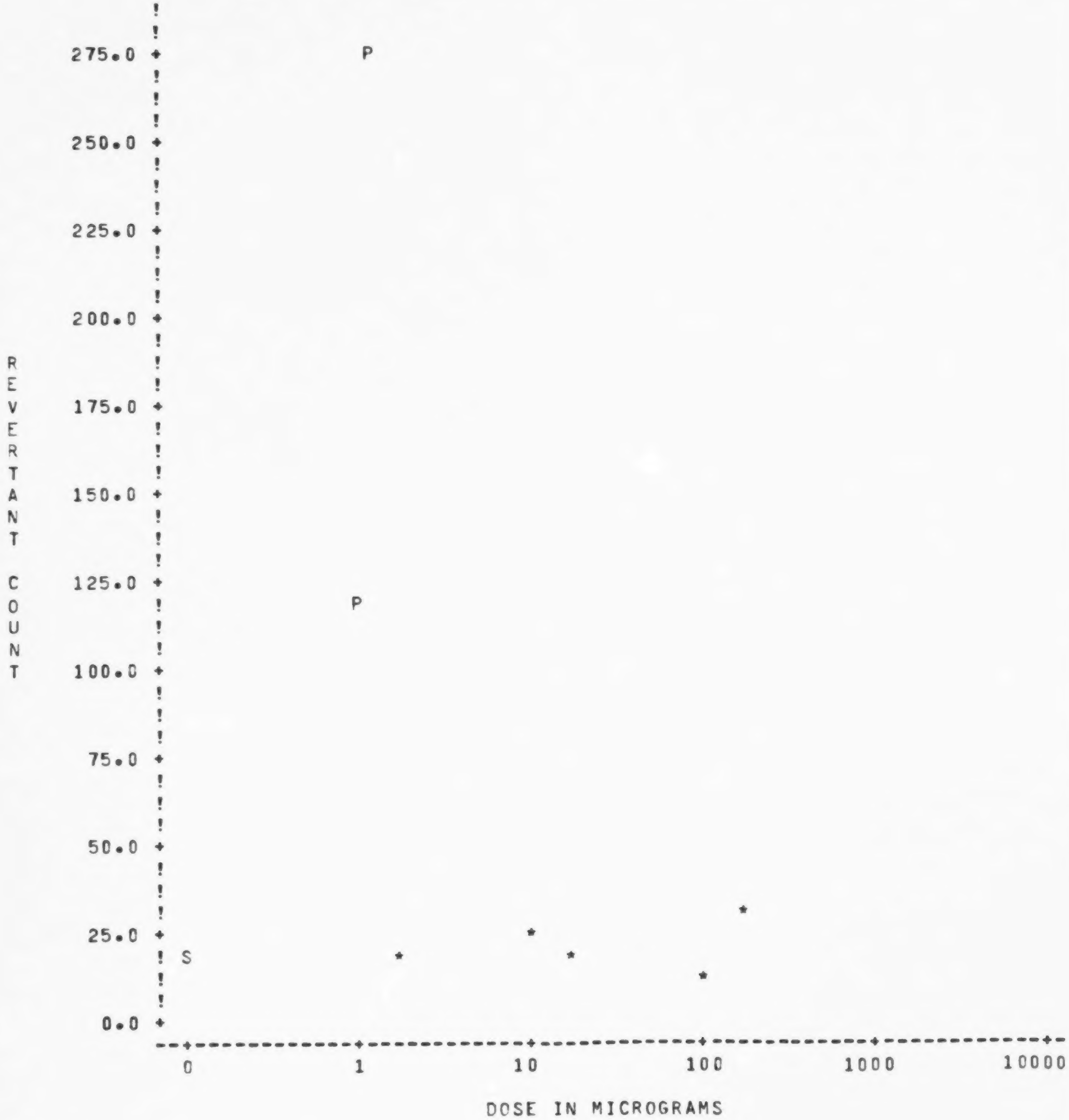
```
            S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=TRC    STRAIN=97    DATE=040783    ACTIV=CSD002    ACTX=05

                   PLOT OF AVGCOUNT*DOSE      SYMBOL IS VALUE OF SPIND

           !
           !
    1100.0 +                P
           !
           !
           !
    1000.0 +
           !
           !
           !
     900.0 +
           !
           !
           !
     800.0 +
           !
R          !               P
E          !
V    700.0 +
E          !
R          !
T          !
A    600.0 +
N          !
T          !
           !
C    500.0 +
O          !
U          !
N          !
T    400.0 +
           !
           !
           !
     300.0 +
           !
           !
           !
     200.0 +
           ! S
           !
           !                   *            *
     100.0 +                             *             *  *
           !
           !
           !
       0.0 +
           --+-------------+-------------+-------------+-------------+-------------+-
             0             1            10            100           1000         10000

                                      DOSE IN MICROGRAMS
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=TRC   STRAIN=97   DATE=040783   ACTIV=HEPA01   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



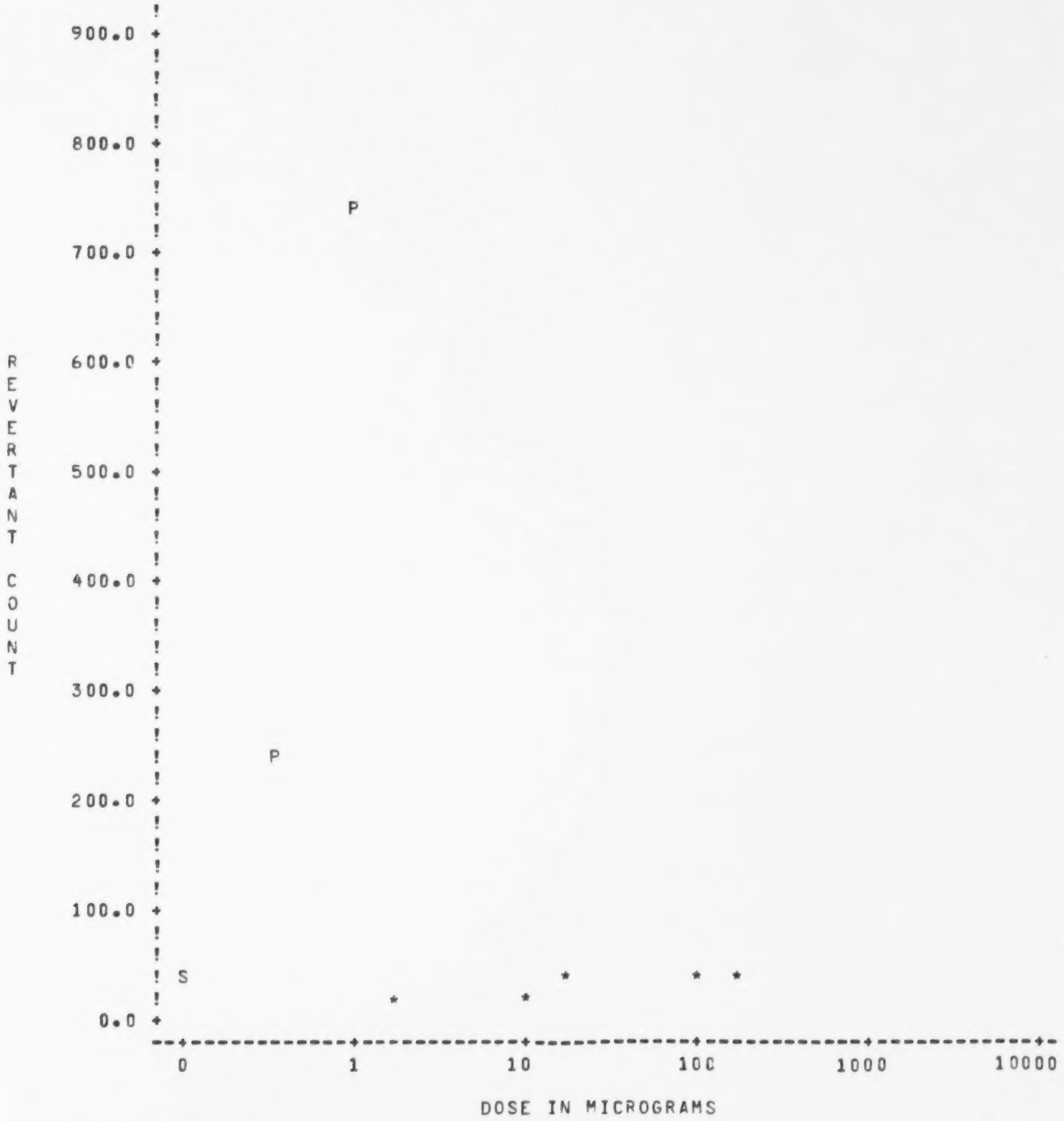
```
                              MUTAGENICITY OF TRC  - TA98

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: TRC       ACTIVATION:
TEST TYPE: 05       STRAIN: TA98        BATCH: D063
DILUTION=   :       PLATED=             COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99     0.00      19        19        17       18.3      1.2    A    1.0
 P1 03     1.00      82       139       142      121.0     33.8    A    6.6
 P2 03     2.00     222       341       267      276.7     60.1    A   15.1
           3.00      15        20        17       17.3      2.5         0.9
          10.00      27        26        18       23.7      4.9         1.3
          33.00      16        17        17       16.7      0.6         0.9
         100.00      17        12        17       15.3      2.9         0.8
         333.00      45        20        22       29.0     13.9         1.6

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: TRC       ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98        BATCH: D063
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99     0.00      22        32        23       25.7      5.5    A    1.0
 P1 04     1.00     793       866       679      779.3     94.2    A   30.3
 P2 04     2.00    1567      1696      1573     1612.0     72.8    A   62.7
           3.00      24        36        31       30.3      6.0         1.2
          10.00      24        29        21       24.7      4.0         1.0
          33.00      21        29        31       27.0      5.3         1.1
         100.00      36        21        34       30.3      8.1         1.2
         333.00      41        31        34       35.3      5.1         1.4

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: TRC       ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98        BATCH: D063
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99     0.00      41        35        26       34.0      7.5    A    1.0
 P1 04     0.50     198       262       238      232.7     32.3    A    6.8
 P2 04     1.00     747       808       672      742.3     68.1    A   21.8
           3.00      25        27        30       27.3      2.5         0.8
          10.00      22        36        26       28.0      7.2         0.8
          33.00      40        28        40       36.0      6.9         1.1
         100.00      27        23        41       30.3      9.5         0.9
         333.00      34        38        40       37.3      3.1         1.1
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482    CHEM=TRC    STRAIN=98    DATE=040783    ACTIV=     ACT%=05

                PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



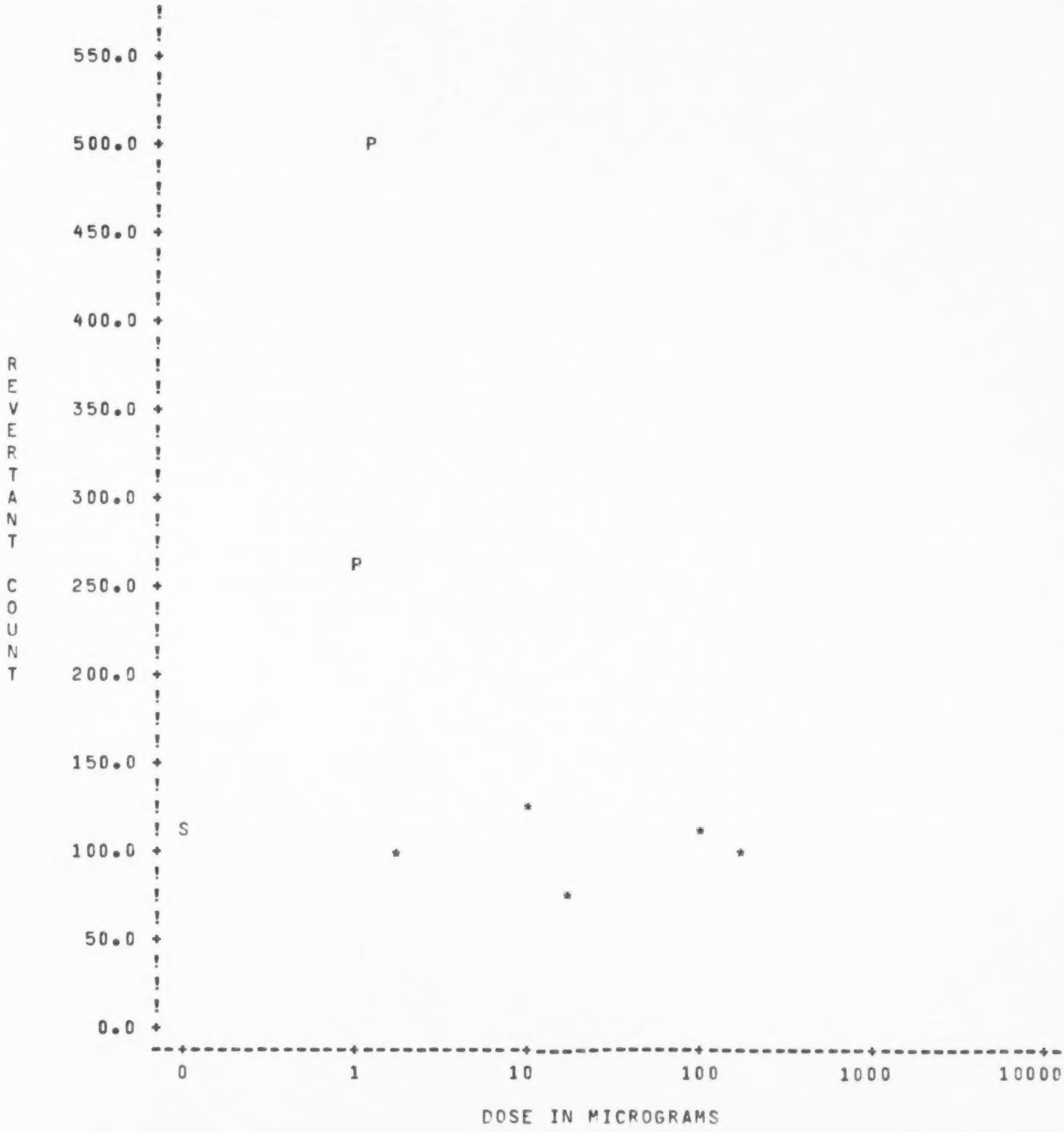
```
           S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
   CON=191482   CHEM=TRC   STRAIN=98   DATE=040783   ACTIV=CSD002   ACT%=05

                   PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1800.0 +
           !
           !
           !
           !
    1600.0 +               P
           !
           !
           !
           !
    1400.0 +
           !
           !
           !
           !
R   1200.0 +
E          !
V          !
E          !
R          !
T   1000.0 +
A          !
N          !
T          !
           !
C    800.0 +
O          !              P
U          !
N          !
T          !
     600.0 +
           !
           !
           !
           !
     400.0 +
           !
           !
           !
           !
     200.0 +
           !
           !
           !
           ! S               *         *  *         *  *
       0.0 +
           --+------------+------------+------------+------------+------------+-
             0            1           10          100         1000       10000

                                    DOSE IN MICROGRAMS
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=TRC    STRAIN=98    DATE=040783    ACTIV=HEPA01    ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



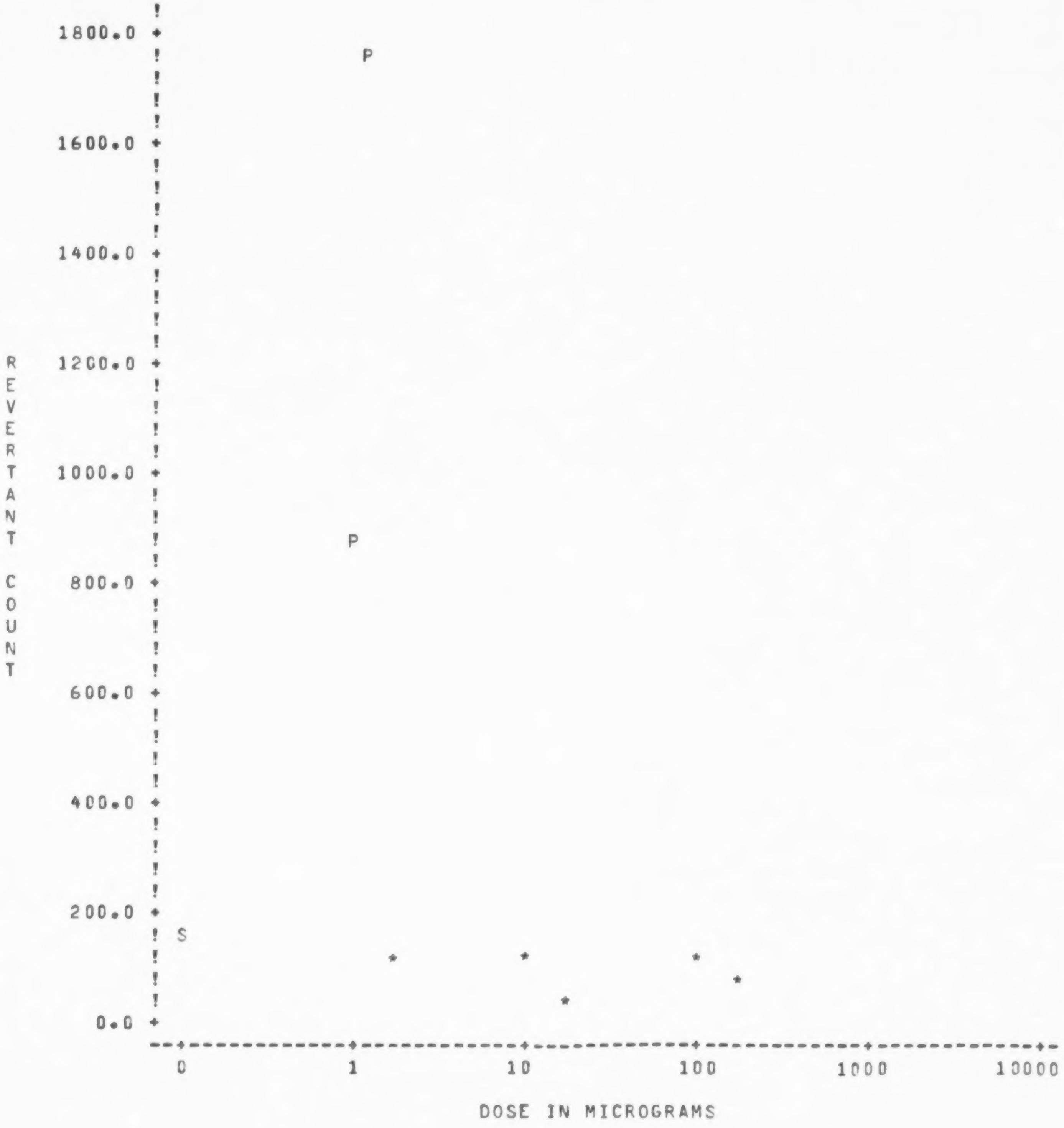
```
                            MUTAGENICITY OF TRC  - TA100

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: TRC       ACTIVATION:
TEST TYPE: 05       STRAIN: TA100       BATCH: D063
DILUTION=   :       PLATED=             COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE   PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL  COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99     0.00   122        92       114       109.3     15.5    A   1.0
 P1 01     1.00   278       284       239       267.0     24.4    A   2.4
 P2 01     2.00   587       493       406       495.3     90.5    A   4.5
           3.00   130        75        83        96.0     29.7        0.9
          10.00   144       107       106       119.0     21.7        1.1
          33.00    82        84        76        80.7      4.2        0.7
         100.00   124       114       115       117.7      5.5        1.1
         333.00   121        92        97       103.3     15.5        0.9

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: TRC       ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100       BATCH: D063
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE   PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL  COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99     0.00   143       167       143       151.0     13.9    A   1.0
 P1 04     1.00   690       970       922       860.7    149.7    A   5.7
 P2 04     2.00  1506      1999      1720      1741.7    247.2    A  11.5
           3.00   128       125        86       113.0     23.4        0.7
          10.00   108       123        72       101.0     26.2        0.7
          33.00    68        63        42        57.7     13.8        0.4
         100.00   150        84       107       113.7     33.5        0.8
         333.00    88        68           9      78.0     14.1        0.5

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040783    CHEMICAL: TRC       ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100       BATCH: D063
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE   PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL  COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 99     0.00   130       120       111       120.3      9.5    A   1.0
 P1 04     0.50   302       417       458       392.3     80.9    A   3.3
 P2 04     1.00   236       231       367       278.0     77.1    A   2.3
           3.00   183       159       151       164.3     16.7        1.4
          10.00   177       191       167       178.3     12.1        1.5
          33.00   150       188       177       171.7     19.6        1.4
         100.00   145       220       185       183.3     37.5        1.5
         333.00   167       174       147       162.7     14.0        1.4
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482    CHEM=TRC    STRAIN=100    DATE=040783    ACTIV=     ACT%=05

               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

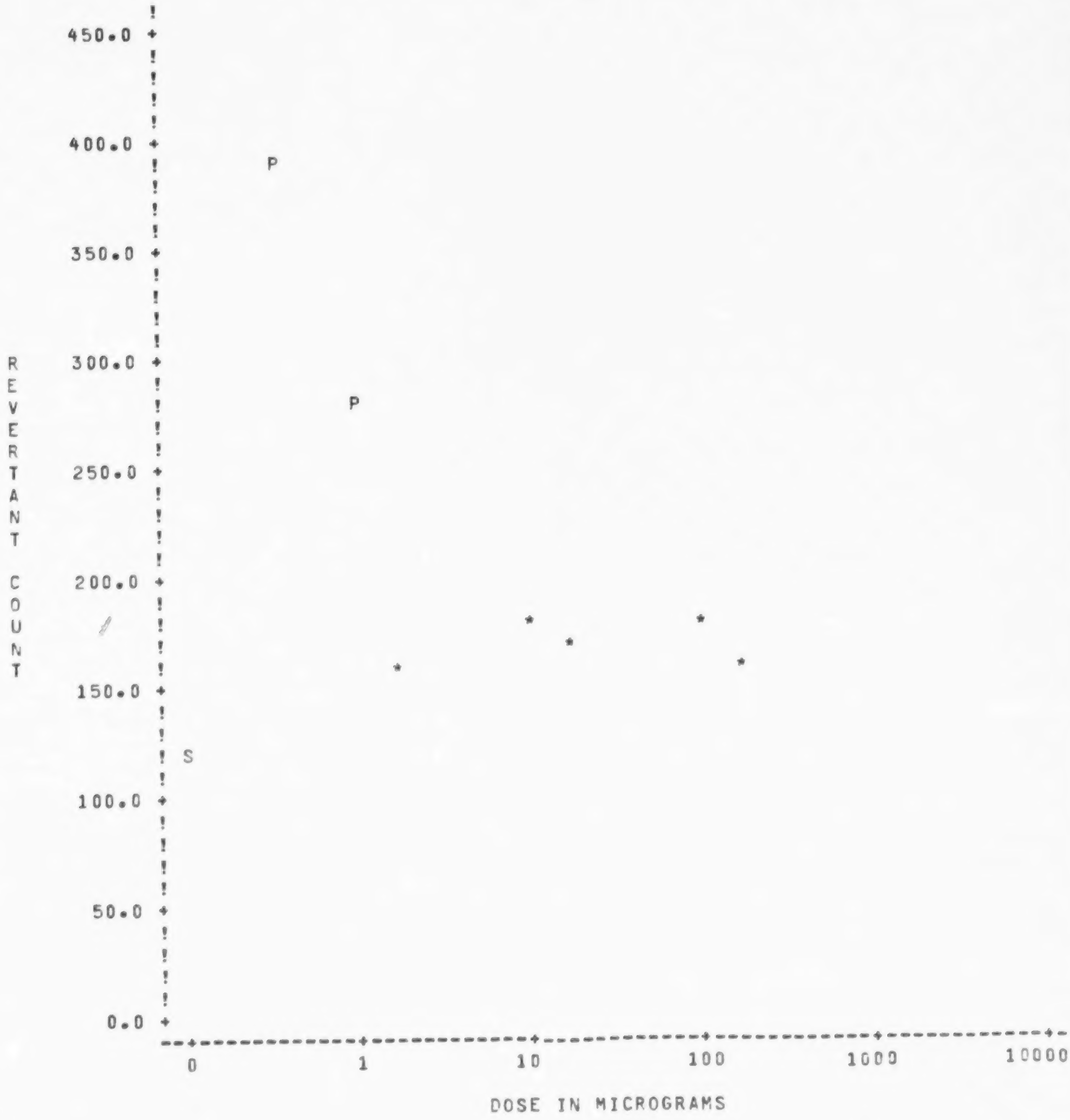


S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=TRC   STRAIN=100   DATE=040783   ACTIV=CSD002   ACT%=05

PLOT OF AVGCOUNT*DOSE   SYMBOL IS VALUE OF SPIND

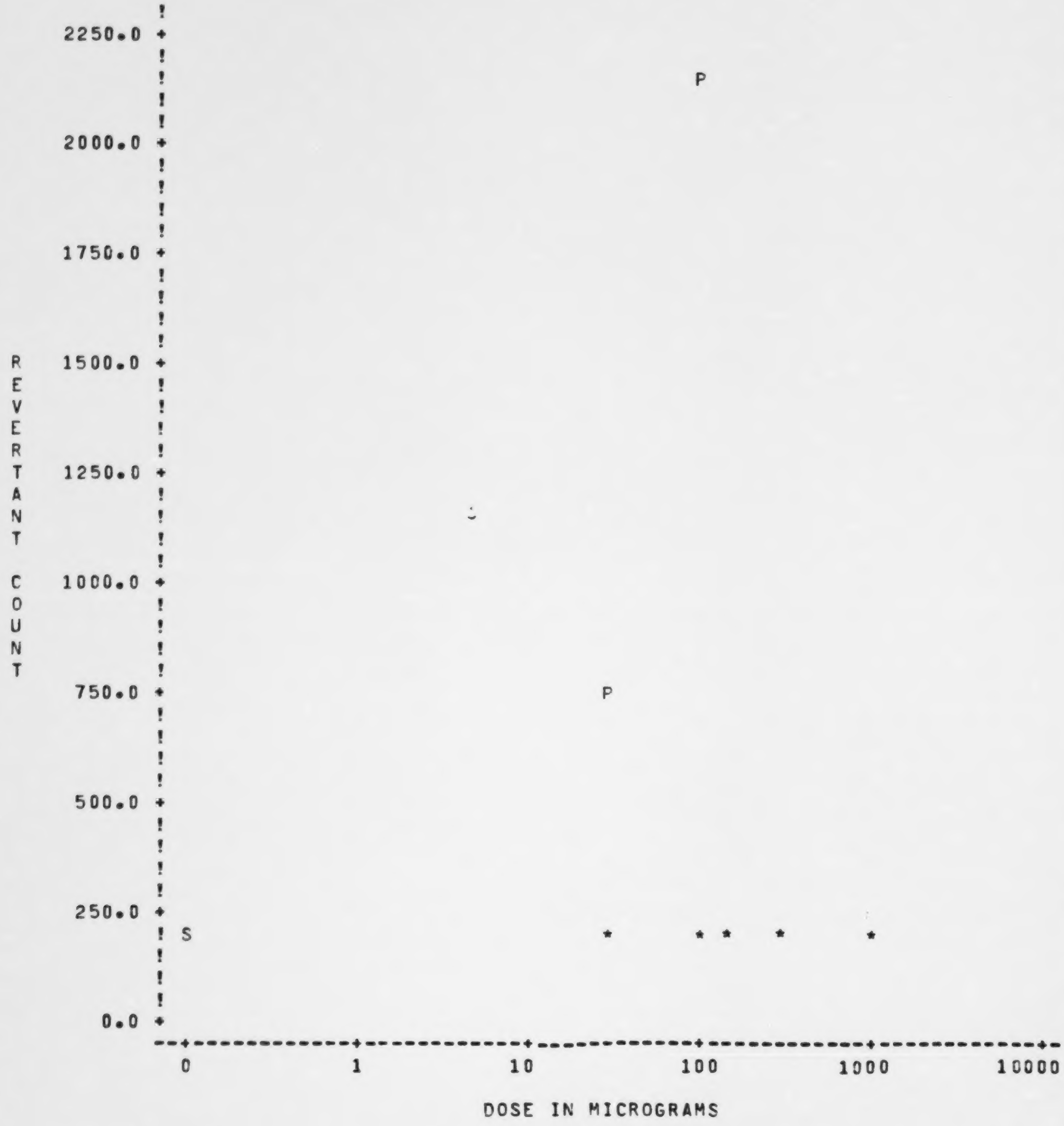


```
               S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=TRC   STRAIN=100   DATE=040783   ACTIV=HEPA01   ACT%=05

                   PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

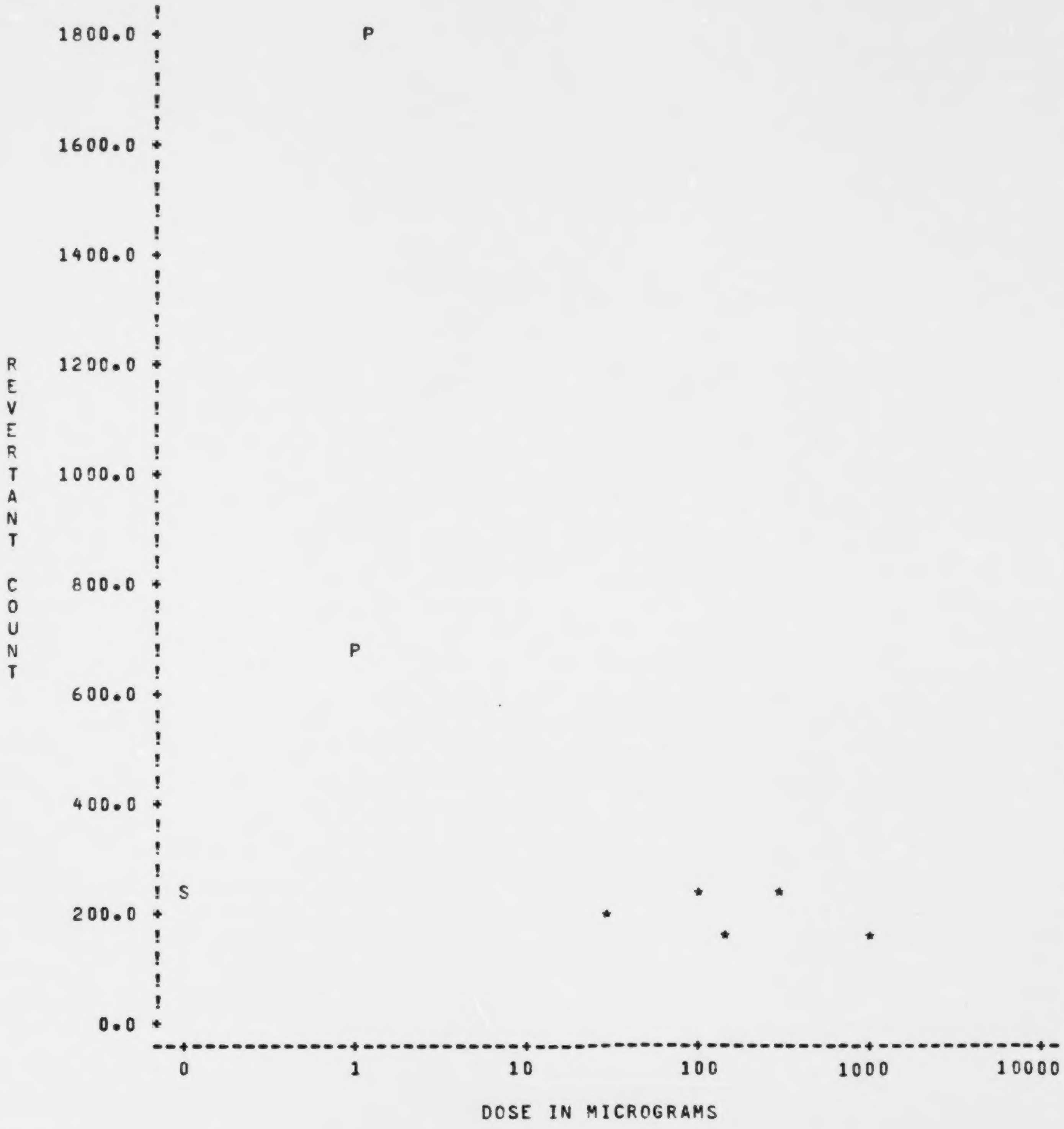


```
                        MUTAGENICITY OF EDC  - TA97

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EDC       ACTIVATION:
TEST TYPE: 05       STRAIN: TA97        BATCH: D073
DILUTION=   :       PLATED=             COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     188       193       194      191.7       3.2    A    1.0
 P1 02     50.00     735       832       664      743.7      84.3    A    3.9
 P2 02    100.00    1875      2285      2249     2136.3     227.0    A   11.1
           50.00     192       203       230      208.3      19.6         1.1
          100.00     229       196       222      215.7      17.4         1.1
          250.00     187       192       165      181.3      14.4         0.9
          500.00     176       202       167      181.7      18.2         0.9
         1000.00     202       219       186      202.3      16.5         1.1

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EDC       ACTIVATION: CSD001
TEST TYPE: 05       STRAIN: TA97        BATCH: D073
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     228       215       225      222.7       6.8    A    1.0
 P1 04      1.00     678       703       698      693.0      13.2    A    3.1
 P2 04      2.00    1713      1808      1873     1798.0      80.5    A    8.1
           50.00     217       163       214      198.0      30.3         0.9
          100.00     194       253       213      220.0      30.1         1.0
          250.00     185       164       182      177.0      11.4         0.8
          500.00     214       262       243      239.7      24.2         1.1
         1000.00     233       195         0      142.7     125.0         0.6

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EDC       ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA97        BATCH: D073
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     242       199       181      207.3      31.3    A    1.0
 P1 04      0.50     378       344       359      360.3      17.0    A    1.7
 P2 04      1.00    1135      1147      1099     1127.0      25.0    A    5.4
           50.00     226       191       230      215.7      21.5         1.0
          100.00     212       244       233      229.7      16.3         1.1
          250.00     243       214       214      223.7      16.7         1.1
          500.00     289       285       222      265.3      37.6         1.3
         1000.00       9       173       184      122.0      98.0         0.6
```

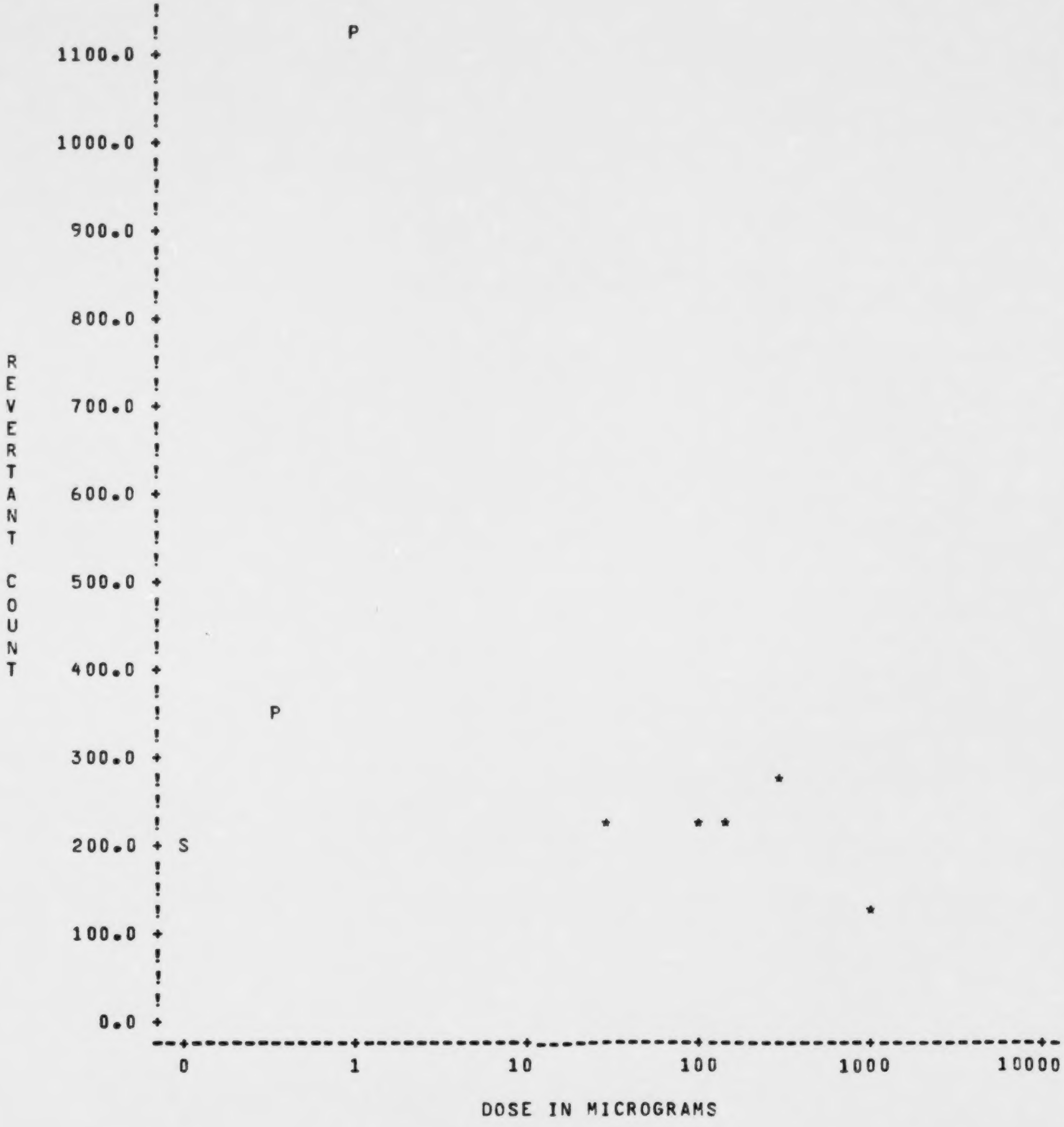
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482    CHEM=EDC    STRAIN=97    DATE=040883    ACTIV=     ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EDC   STRAIN=97   DATE=040883   ACTIV=CSD001   ACTX=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



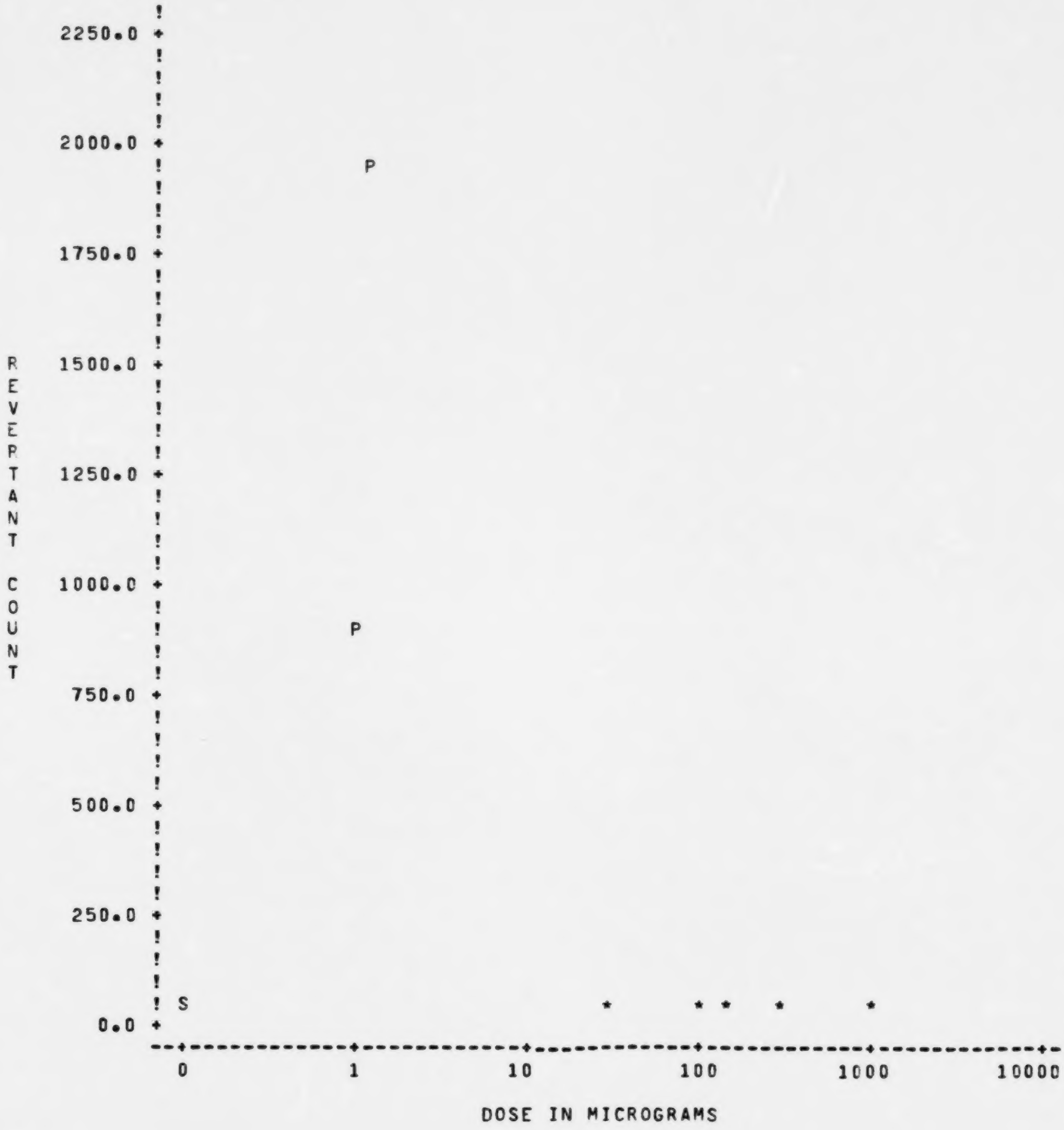
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EDC   STRAIN=97   DATE=040883   ACTIV=HEPA01   ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



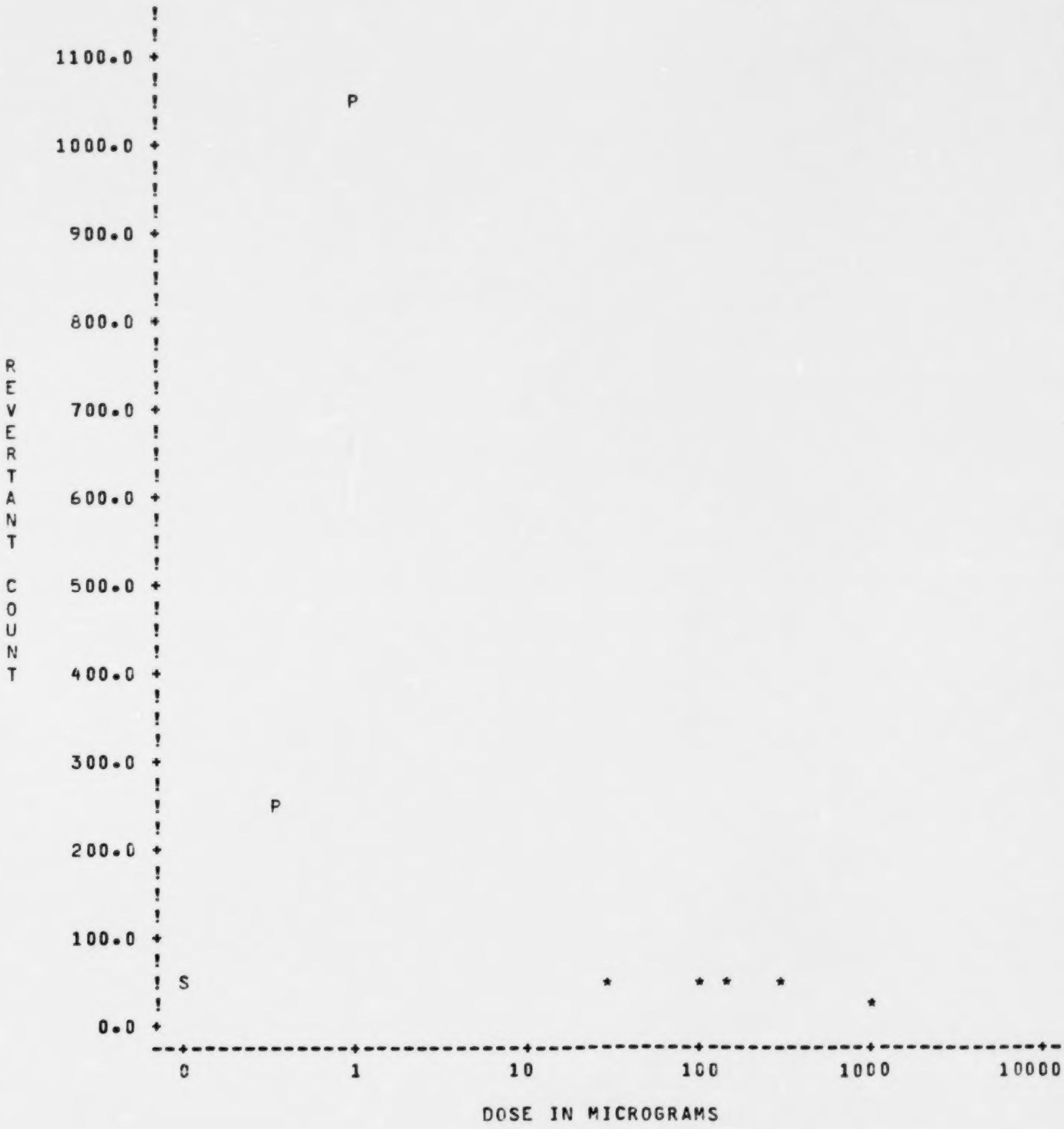
MUTAGENICITY OF EDC - TA98

```
M U T A G E N I C I T Y                        CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EDC              ACTIVATION:
TEST TYPE: 05       STRAIN: TA98               BATCH: D073
DILUTION=    :      PLATED=                    COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00      27         41         31        33.0       7.2    A    1.0
 P1 03      1.00     161        163        141       155.0      12.2    A    4.7
 P2 03      2.00     264        265        424       317.7      92.1    A    9.6
           50.00      40             4      30        35.0       7.1         1.1
          100.00      44         30         32        35.3       7.6         1.1
          250.00      44         34         45        41.0       6.1         1.2
          500.00      52         40         29        40.3      11.5         1.2
         1000.00      37         26         25        29.3       6.7         0.9

M U T A G E N I C I T Y                        CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EDC              ACTIVATION: CSD001
TEST TYPE: 05       STRAIN: TA98               BATCH: D073
DILUTION=  1: 20    PLATED= 100                COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00      39         42         42        41.0       1.7    A    1.0
 P1 04      1.00     915        803        990       902.7      94.1    A   22.0
 P2 04      2.00    1839       1948       2020      1935.7      91.1    A   47.2
           50.00      32         36         44        37.3       6.1         0.9
          100.00      22         47         52        40.3      16.1         1.0
          250.00      49         33         36        39.3       8.5         1.0
          500.00      39         35         42        38.7       3.5         0.9
         1000.00      49         65         41        51.7      12.2         1.3

M U T A G E N I C I T Y                        CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EDC              ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98               BATCH: D073
DILUTION=  1: 20    PLATED= 100                COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 99      0.00      40         42         40        40.7       1.2    A    1.0
 P1 04      0.50     216        288        235       246.3      37.3    A    6.1
 P2 04      1.00    1046        986       1107      1046.3      60.5    A   25.7
           50.00      54         42         46        47.3       6.1         1.2
          100.00      40         39         41        40.0       1.0         1.0
          250.00      40         39         42        40.3       1.5         1.0
          500.00      50         43         52        48.3       4.7         1.2
         1000.00      43         30         34        35.7       6.7         0.9
```

```
           S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
     CON=191482    CHEM=EDC    STRAIN=98    DATE=040883    ACTIV=     ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

          !
          !
    330.0 +
          !
          !              P
          !
    300.0 +
          !
          !
          !
    270.0 +
          !
          !
          !
    240.0 +
          !
R         !
E         !
V   210.0 +
E         !
R         !
T         !
A   180.0 +
N         !
T         !
          !             P
C   150.0 +
O         !
U         !
N         !
T   120.0 +
          !
          !
          !
     90.0 +
          !
          !
          !
     60.0 +
          !
          !
          !                              *      * *   *
     30.0 + S                                               *
          !
          !
          !
      0.0 +
          --+-----------+-----------+-----------+-----------+-----------+-
            0           1          10          100        1000       10000

                                 DOSE IN MICROGRAMS
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EDC   STRAIN=98   DATE=040883   ACTIV=CSD001   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EDC   STRAIN=98   DATE=040883   ACTIV=HEPA01   ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

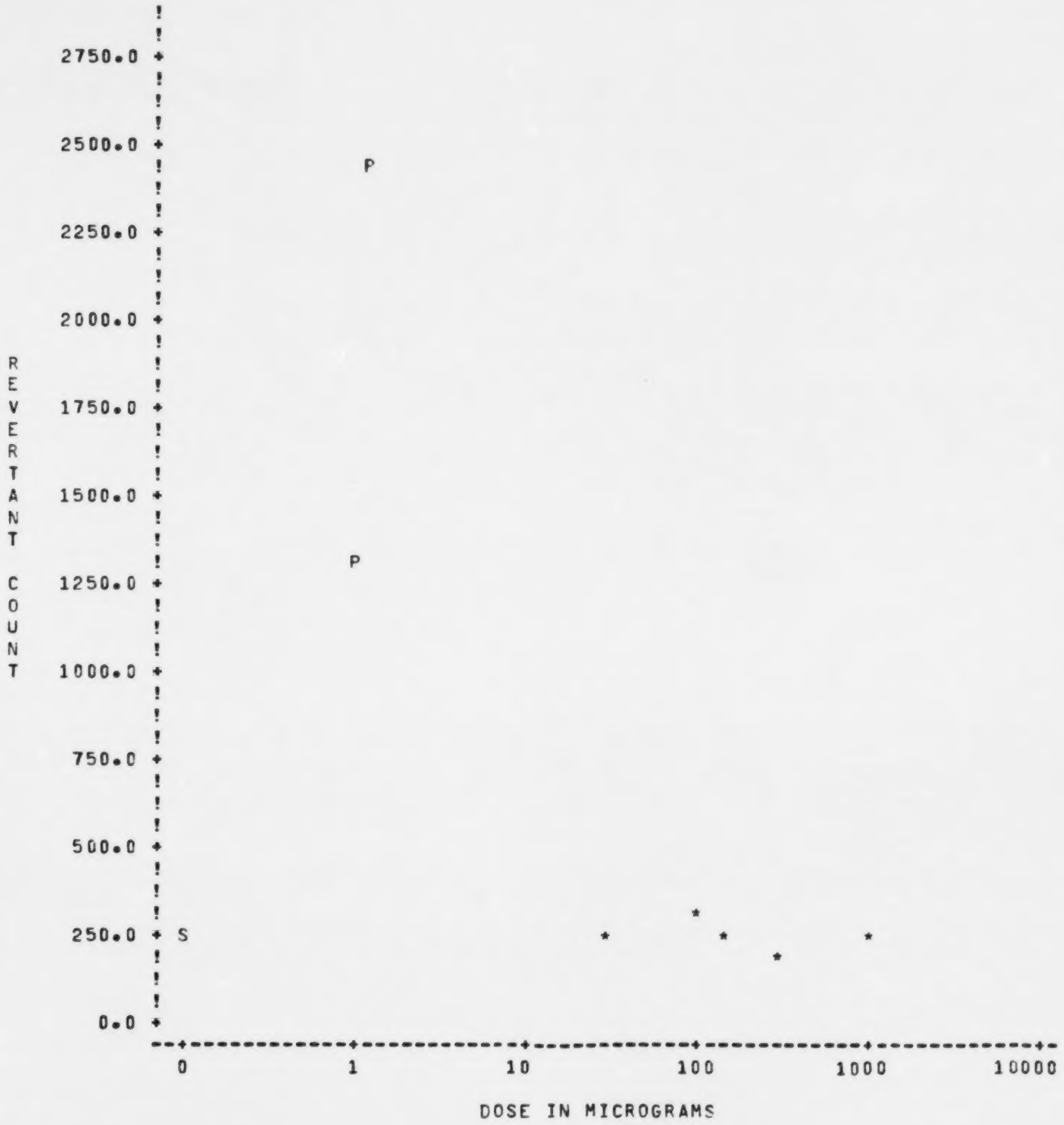


MUTAGENICITY OF EDC - TA100

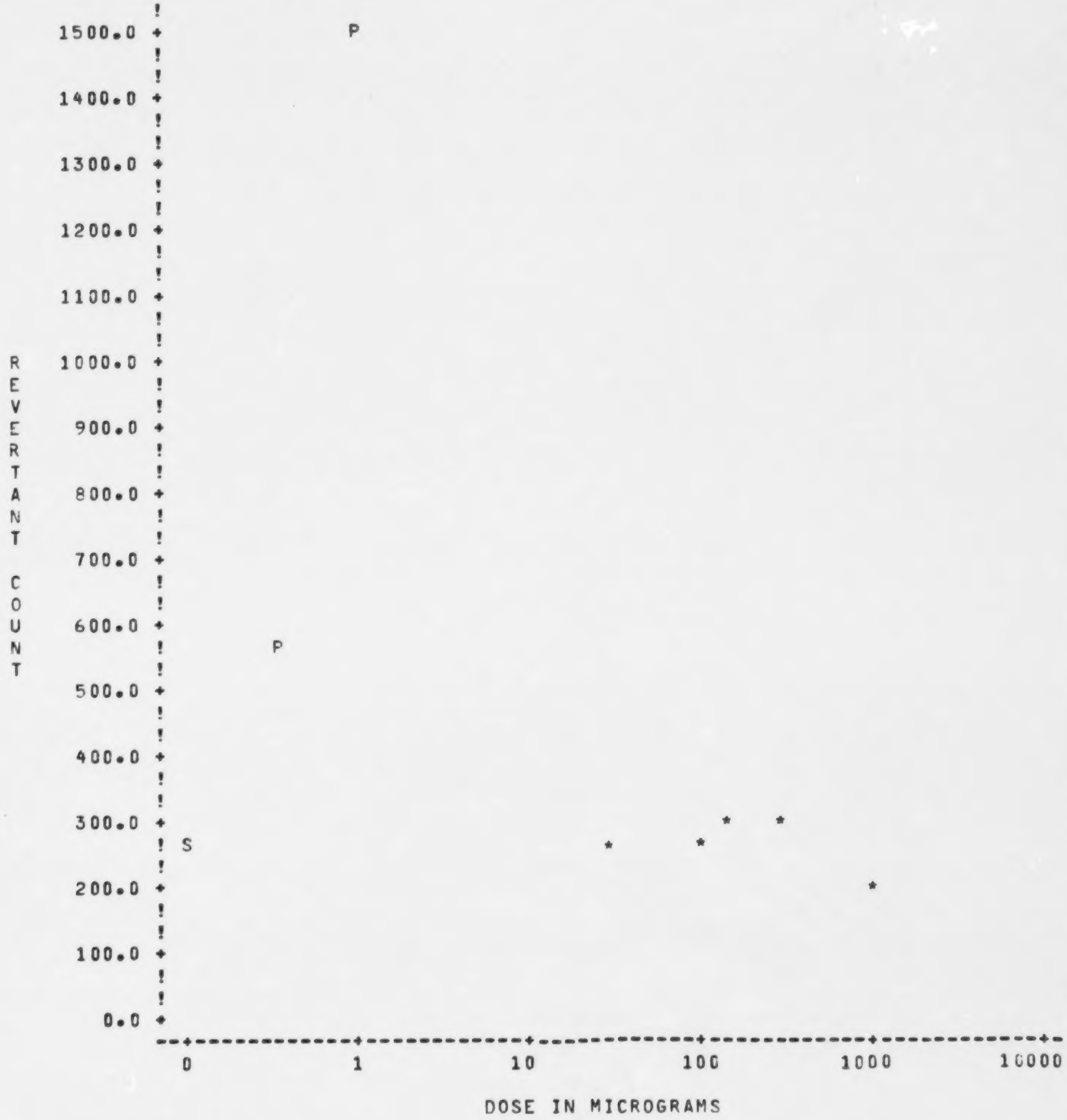
```
M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040883      CHEMICAL: EDC              ACTIVATION:
TEST TYPE: 05         STRAIN: TA100              BATCH: D073
DILUTION=   :         PLATED=                    COLONIES=
MIXTURE=              TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG  COUNT    COUNT

 S1 99      0.00    339       320       248      302.3     48.0    NA   1.0
 P1 01      1.00    603       598       568      589.7     18.9    A    2.0
 P2 01      2.00    783      1023       909      905.0    120.0    A    3.0
           50.00    371       343       301      338.3     35.2         1.1
          100.00    284       220       192      232.0     47.2         0.8
          250.00    351       350       344      348.3      3.8         1.2
          500.00    344       327       323      331.3     11.2         1.1
         1000.00    572       636       561      589.7     40.5         2.0    *

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040883      CHEMICAL: EDC              ACTIVATION: CSD001
TEST TYPE: 05         STRAIN: TA100              BATCH: D073
DILUTION=  1: 20      PLATED= 100                COLONIES=
MIXTURE= 500          TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG  COUNT    COUNT

 S1 99      0.00    266       256       245      255.7     10.5    NA   1.0
 P1 04      1.00    969      1522      1507     1332.7    315.0    A    5.2
 P2 04      2.00   2193      2622      2515     2443.3    223.3    A    9.6
           50.00    236       293       194      241.0     49.7         0.9
          100.00    352       311       339      334.0     21.0         1.3
          250.00    212       230       221      221.0      9.0         0.9
          500.00    230       202       161      197.7     34.7         0.8
         1000.00    202       241       220      221.0     19.5         0.9

M U T A G E N I C I T Y                          CONTRACT NO.: 191482
EXP DATE: 040883      CHEMICAL: EDC              ACTIVATION: HEPA01
TEST TYPE: 05         STRAIN: TA100              BATCH: D073
DILUTION=  1: 20      PLATED= 100                COLONIES=
MIXTURE= 500          TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG  COUNT    COUNT

 S1 99      0.00    272       213       275      253.3     35.0    NA   1.0
 P1 04      0.50    554       603       571      576.0     24.9    A    2.3
 P2 04      1.00   1422      1617      1467     1502.0    102.1    A    5.9
           50.00    284       282       274      280.0      5.3         1.1
          100.00    266       306       261      277.7     24.7         1.1
          250.00    263       258       356      292.3     55.2         1.2
          500.00    288       343       297      309.3     29.5         1.2
         1000.00    282       194       163      213.0     61.7         0.8
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
     CON=191482   CHEM=EDC   STRAIN=100   DATE=040883   ACTIV=    ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
     900.0 +             P
           !
           !
           !
           !
     800.0 +
           !
           !
           !
           !
     700.0 +
           !
           !
           !
           !
R    600.0 +
E          !            P                                   *
V          !
E          !
R          !
T    500.0 +
A          !
N          !
T          !
           !
C    400.0 +
O          !
U          !
N          !                              *       *   *
T          !
     300.0 + S
           !
           !
           !                                    *
           !
     200.0 +
           !
           !
           !
           !
     100.0 +
           !
           !
           !
           !
       0.0 +
          --+-----------+-----------+-----------+-----------+-----------+-
            0           1          10          100        1000       10000

                               DOSE IN MICROGRAMS
```

```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482    CHEM=EDC    STRAIN=100    DATE=040883    ACTIV=CSD001    ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



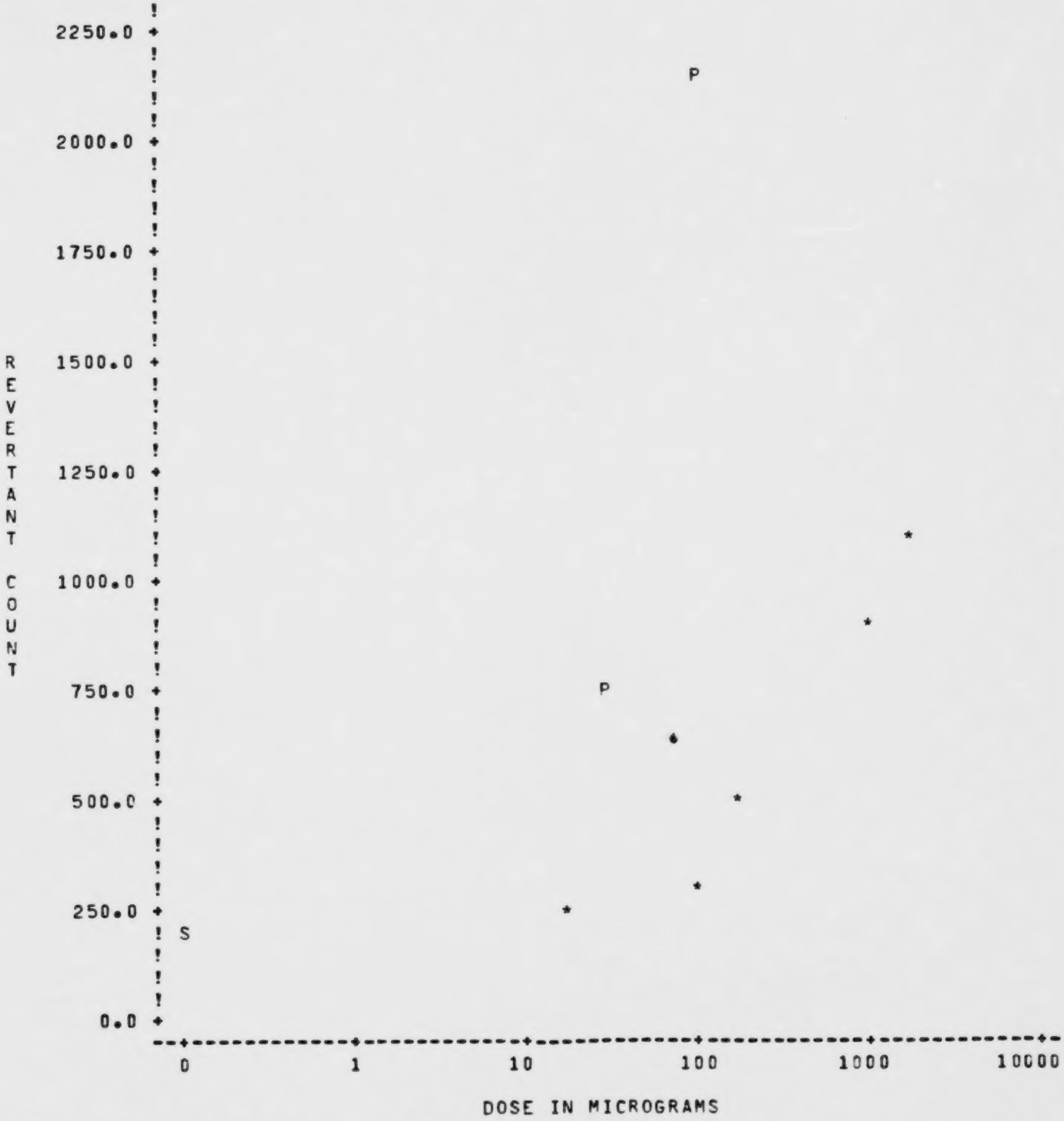
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EDC   STRAIN=100   DATE=040883   ACTIV=HEPA01   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



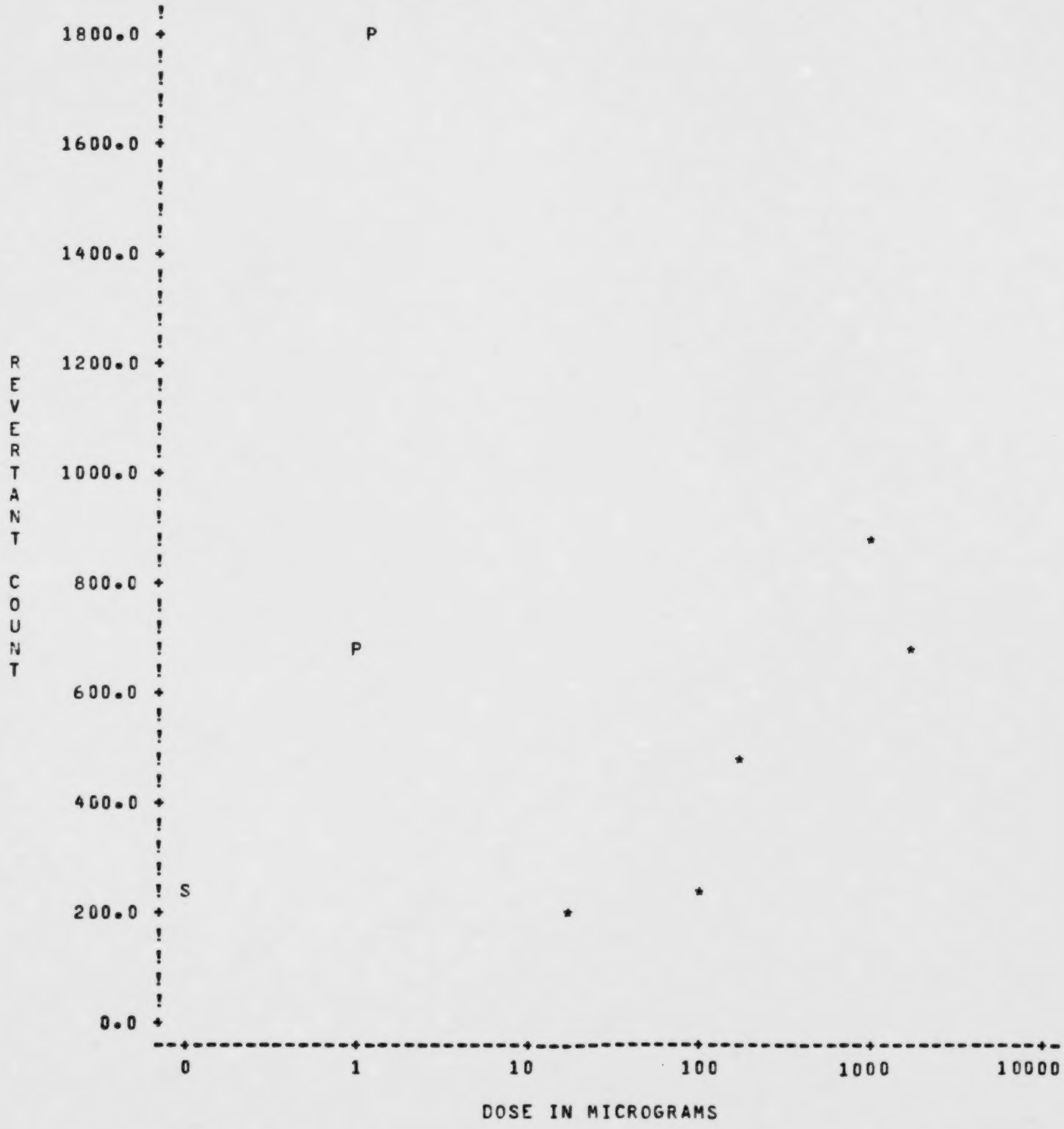
MUTAGENICITY OF EC - TA97

```
M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC             ACTIVATION:
TEST TYPE: 05       STRAIN: TA97             BATCH: D073
DILUTION=   :       PLATED=                  COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99     0.00     188        193       194       191.7       3.2    A    1.0
 P1 02    50.00     735        832       664       743.7      84.3    A    3.9
 P2 02   100.00    1875       2285      2249      2136.3     227.0    A   11.1
          33.00     258        260       245       254.3       8.1         1.3
         100.00     321        337       291       316.3      23.4         1.6
         333.00     513        475       540       509.3      32.7         2.7
        1000.00     866        922       972       920.0      53.0         4.8     *
        3333.00    1145       1101      1124      1123.3      22.0         5.9

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC             ACTIVATION: CSD001
TEST TYPE: 05       STRAIN: TA97             BATCH: D073
DILUTION=  1: 20    PLATED= 100              COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99     0.00     228        215       225       222.7       6.8   NA    1.0
 P1 04     1.00     678        703       698       693.0      13.2    A    3.1
 P2 04     2.00    1713       1808      1873      1798.0      80.5    A    8.1
          33.00     188        243       212       214.3      27.6         1.0
         100.00     220        256       300       258.7      40.1         1.2
         333.00     455        572       431       486.0      75.4         2.2
        1000.00     912        720       955       862.3     125.1         3.9     *
        3333.00     822        704       547       691.0     138.0         3.1

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC             ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA97             BATCH: D073
DILUTION=  1: 20    PLATED= 100              COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99     0.00     242        199       181       207.3      31.3   NA    1.0
 P1 04     0.50     378        344       359       360.3      17.0   NA    1.7
 P2 04     1.00    1135       1147      1099      1127.0      25.0    A    5.4
          33.00     215        192       222       209.7      15.7         1.0
         100.00     205        255       242       234.0      25.9         1.1
         333.00     339        299       301       313.0      22.5         1.5
        1000.00     824        824       812       820.0       6.9         4.0     *
        3333.00    1308       1188      1260      1252.0      60.4         6.0
```

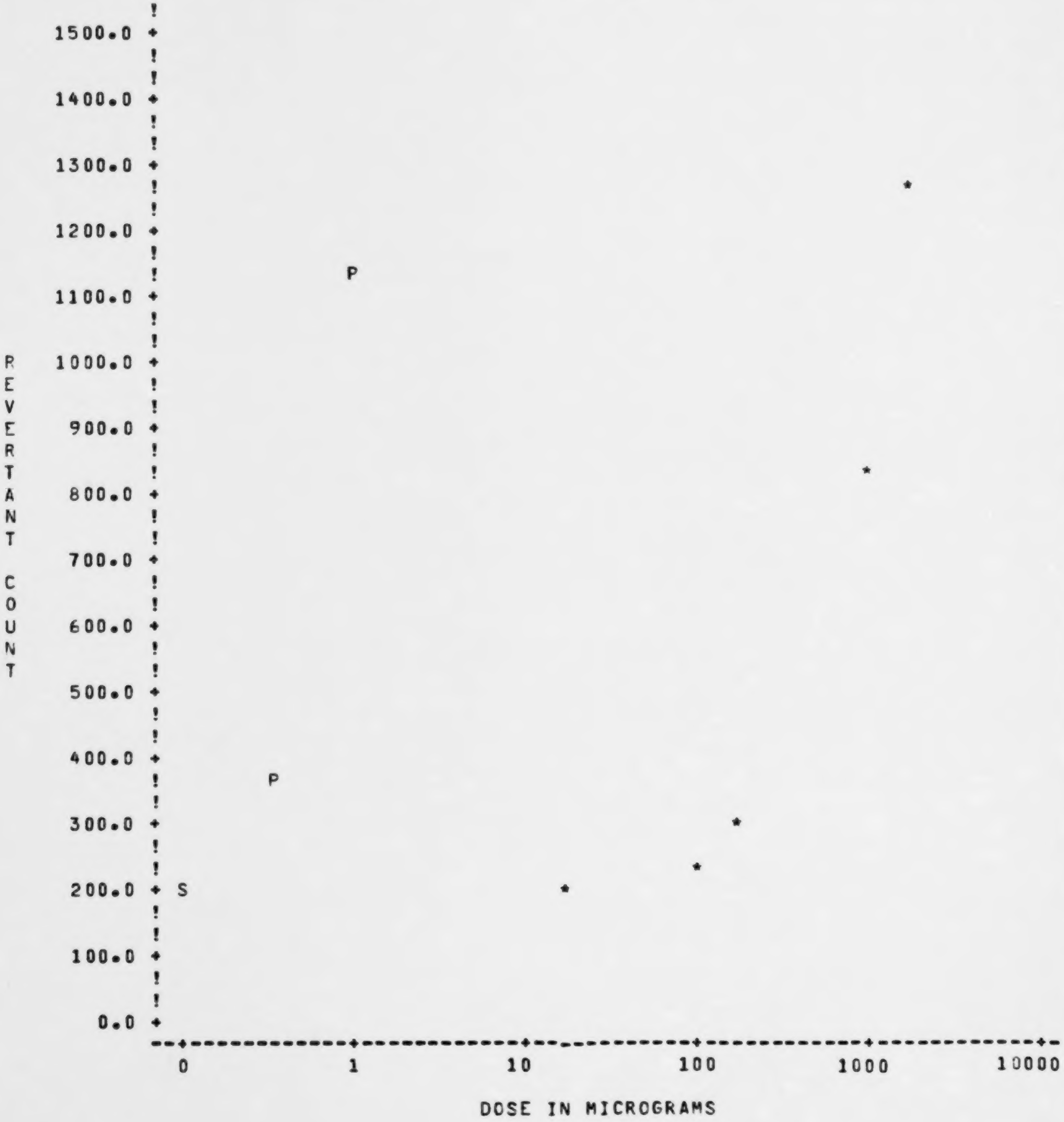
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=97   DATE=040883   ACTIV=    ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=97   DATE=040883   ACTIV=CSD001   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



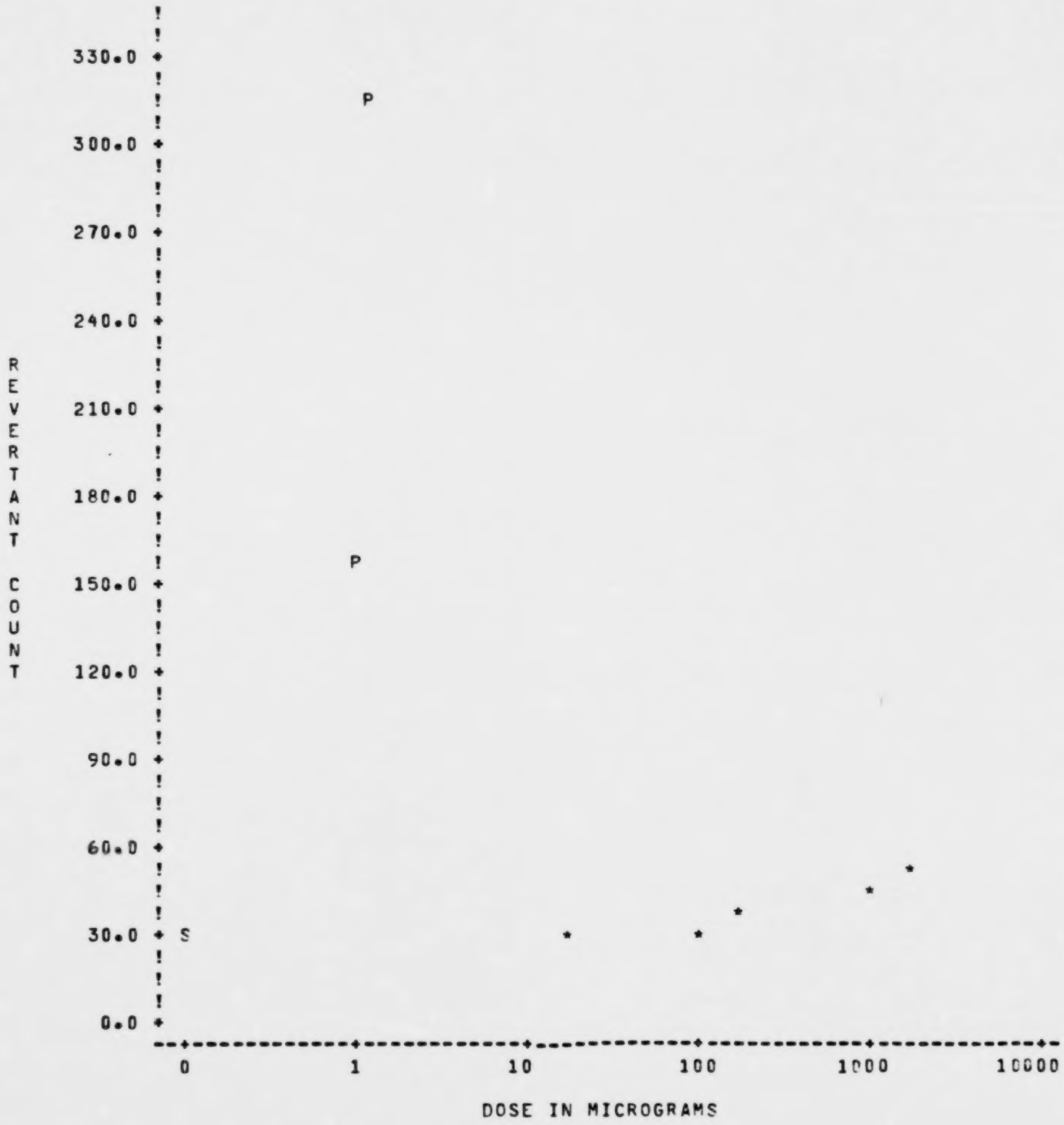
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=97   DATE=040883   ACTIV=HEPA01   ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



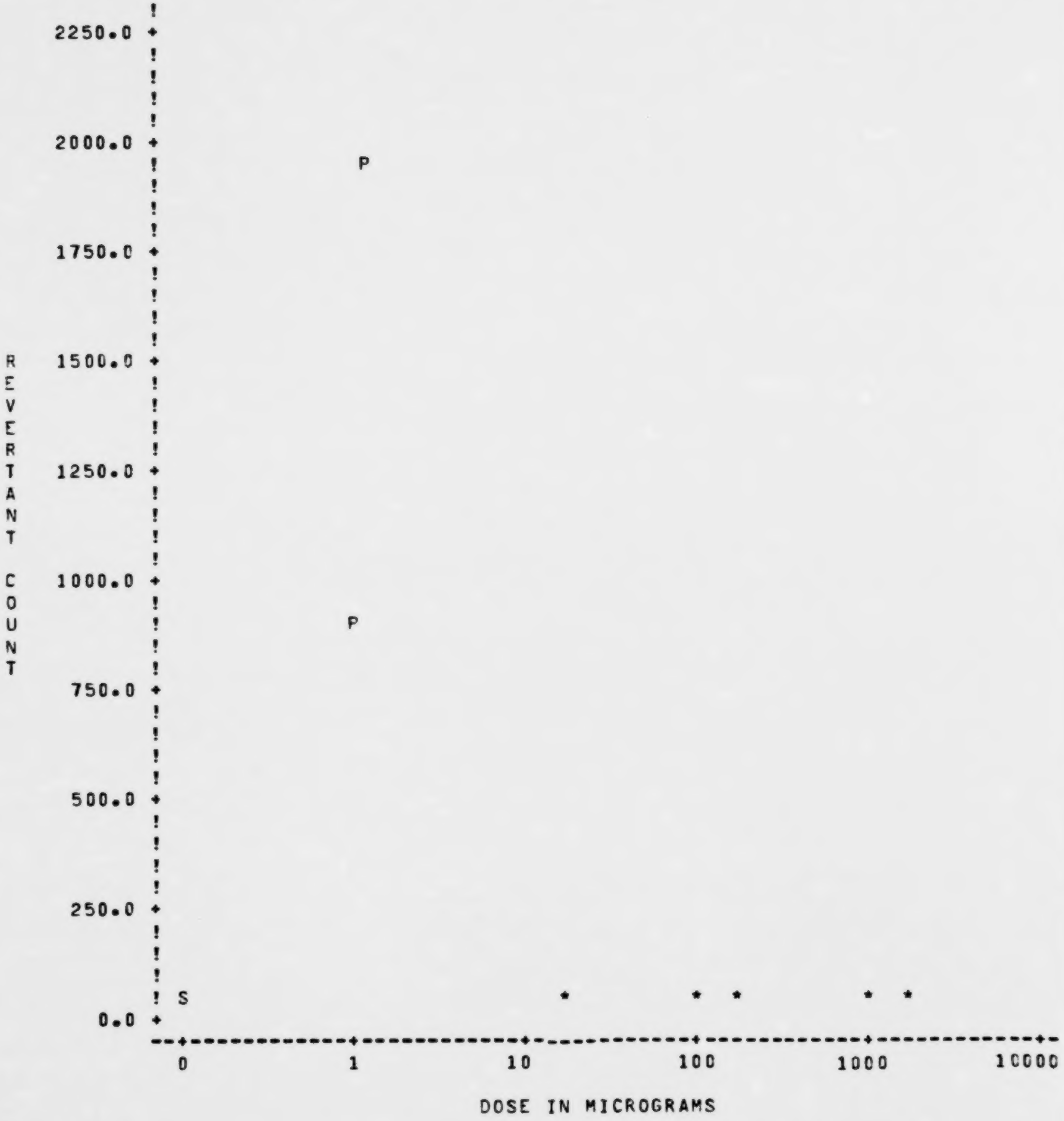
MUTAGENICITY OF EC - TA98

```
M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC            ACTIVATION:
TEST TYPE: 05       STRAIN: TA98            BATCH: D073
DILUTION=   :       PLATED=                 COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00      27        41        31        33.0       7.2    A    1.0
 P1 03      1.00     161       163       141       155.0      12.2    A    4.7
 P2 03      2.00     264       265       424       317.7      92.1    A    9.6
           33.00      36        28        28        30.7       4.6         0.9
          100.00      28        26        30        28.0       2.0         0.8
          333.00      40        38        41        39.7       1.5         1.2
         1000.00      33        52        45        43.3       9.6         1.3
         3333.00      60        42        64        55.3      11.7         1.7

M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC            ACTIVATION: CSD001
TEST TYPE: 05       STRAIN: TA98            BATCH: D073
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00      39        42        42        41.0       1.7   NA    1.0
 P1 04      1.00     915       803       990       902.7      94.1    A   22.0
 P2 04      2.00    1839      1948      2020      1935.7      91.1    A   47.2
           33.00      41        44        37        40.7       3.5         1.0
          100.00      44        50        44        46.0       3.5         1.1
          333.00      45        46        50        47.0       2.6         1.1
         1000.00      57        65        67        63.0       5.3         1.5
         3333.00      62        81        73        72.0       9.5         1.8

M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC            ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98            BATCH: D073
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00      40        42        40        40.7       1.2   NA    1.0
 P1 04      0.50     216       288       235       246.3      37.3    A    6.1
 P2 04      1.00    1046       986      1107      1046.3      60.5    A   25.7
           33.00      28        52        44        41.3      12.2         1.0
          100.00      46        49        43        46.0       3.0         1.1
          333.00      59        51        49        53.0       5.3         1.3
         1000.00      76        71        58        68.3       9.3         1.7
         3333.00      89        85        84        86.0       2.6         2.1     *
```

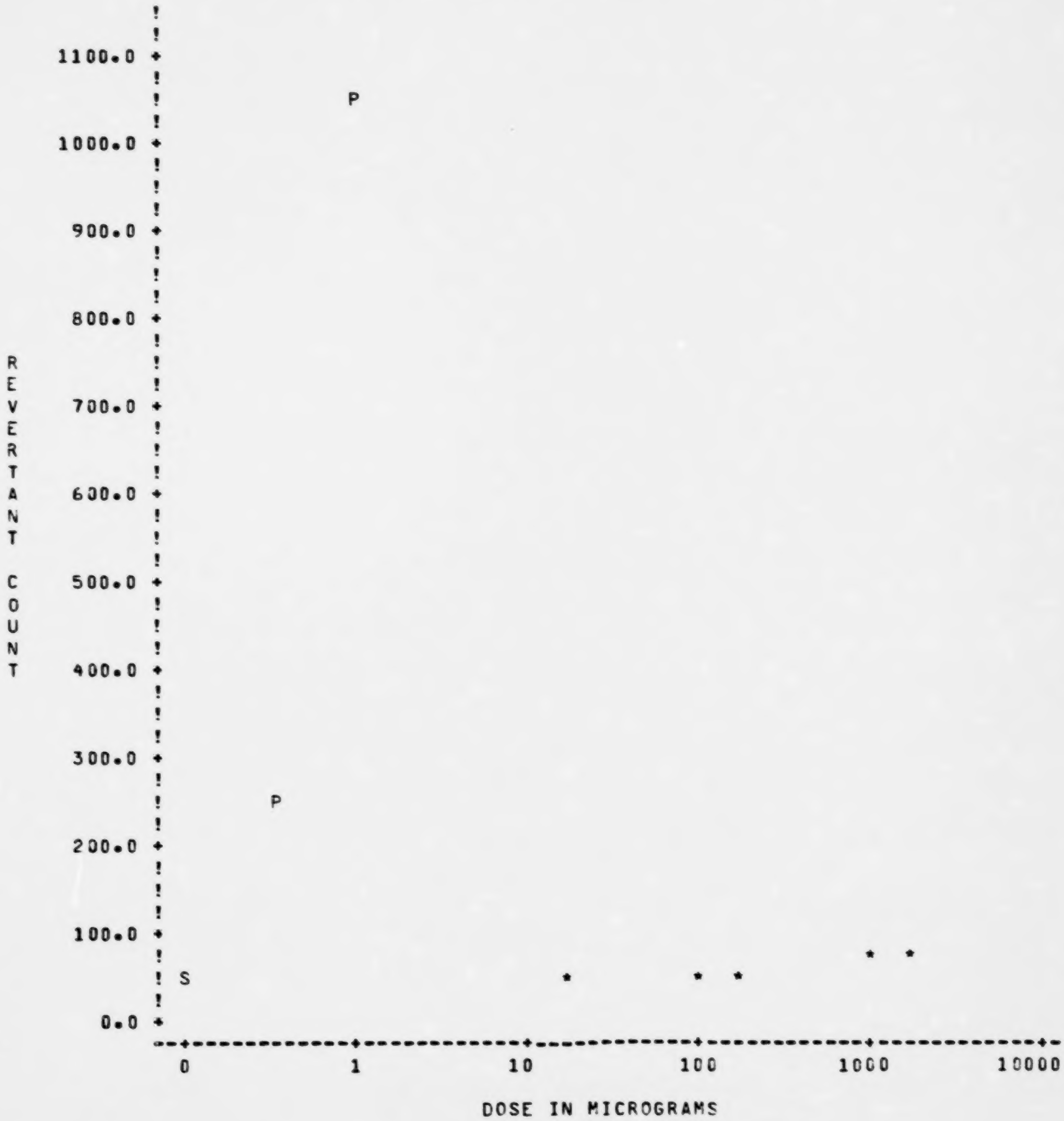
```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=98   DATE=040883   ACTIV=    ACTX=05

           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=98   DATE=040883   ACTIV=CSD001   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



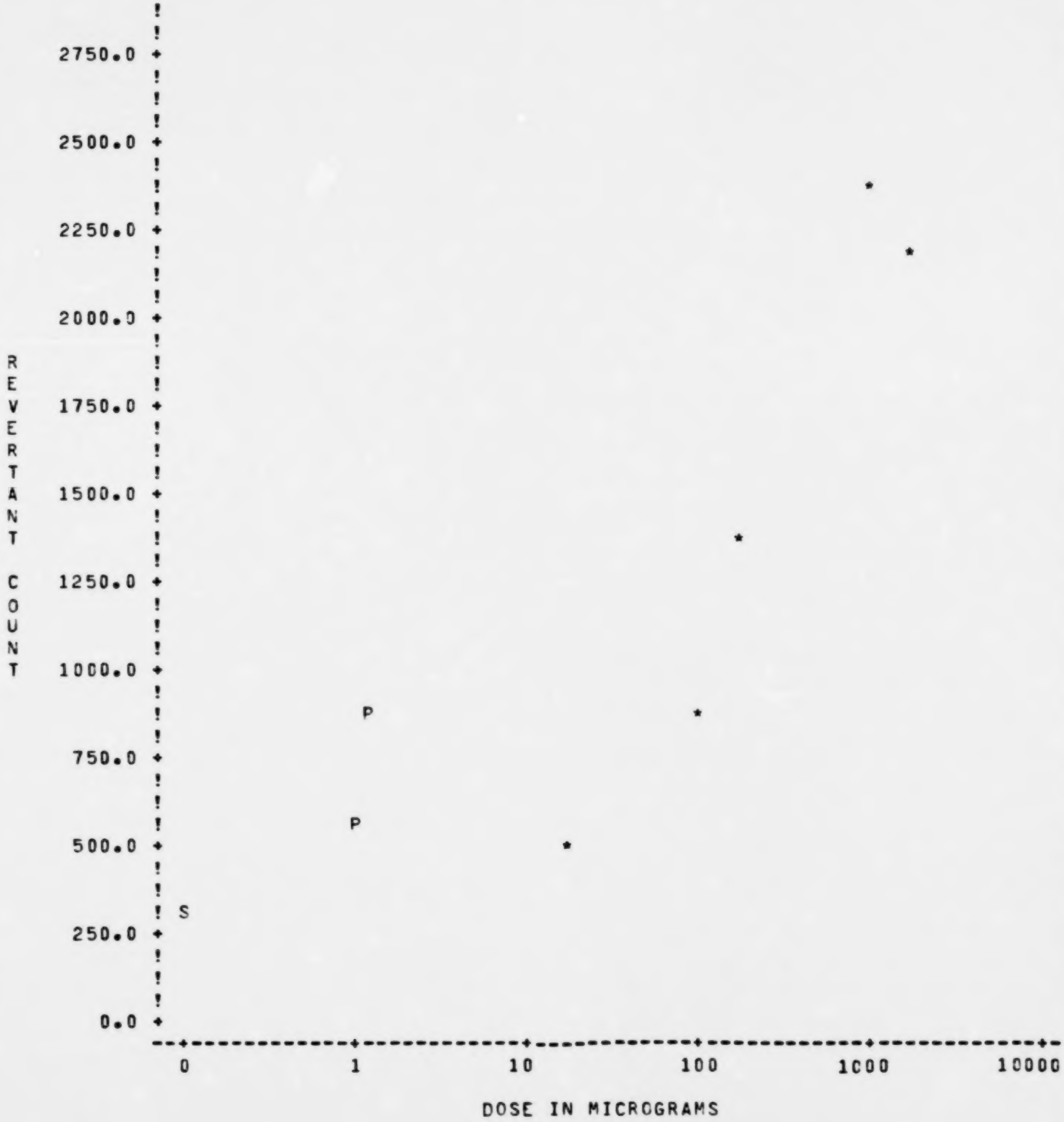
```
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=98   DATE=040883   ACTIV=HEPA01   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



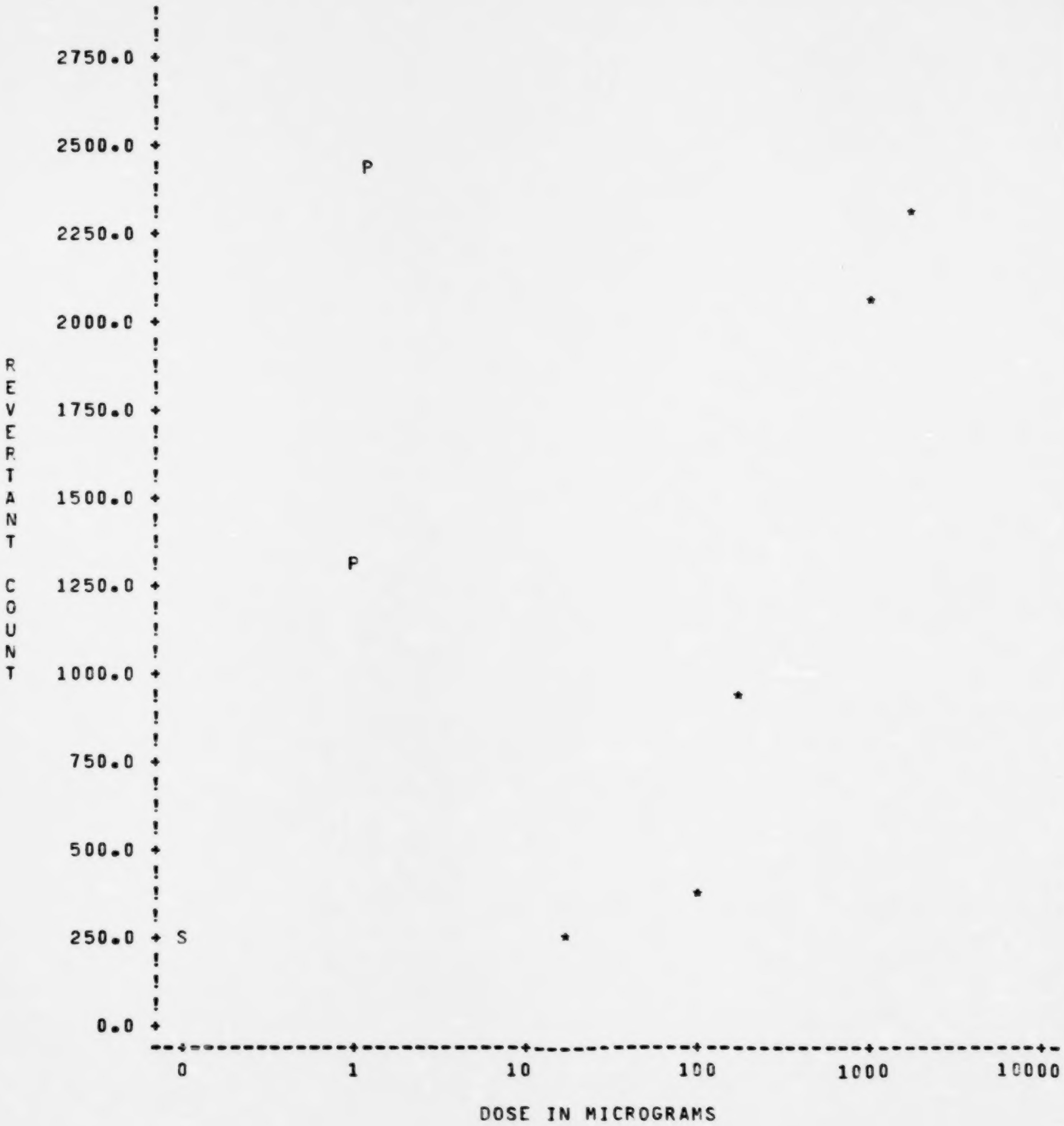
MUTAGENICITY OF EC - TA100

```
M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC        ACTIVATION:
TEST TYPE: 05       STRAIN: TA100       BATCH: D073
DILUTION=   :       PLATED=             COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     339       320       248      302.3      48.0   NA   1.0
 P1 01      1.00     603       598       568      589.7      18.9    A   2.0
 P2 01      2.00     783      1023       909      905.0     120.0    A   3.0
           33.00     612       444       445      500.3      96.7        1.7
          100.00     834       879       885      866.0      27.9        2.9     *
          333.00    1199      1492      1412     1367.7     151.4        4.5
         1000.00    2258      2414      2365     2345.7      79.8        7.8
         3333.00    2200      2212      2162     2191.3      26.1        7.2

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC        ACTIVATION: CSD001
TEST TYPE: 05       STRAIN: TA100       BATCH: D073
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     266       256       245      255.7      10.5   NA   1.0
 P1 04      1.00     969      1522      1507     1332.7     315.0    A   5.2
 P2 04      2.00    2193      2622      2515     2443.3     223.3    A   9.6
           33.00     258       281       255      264.7      14.2        1.0
          100.00     448       351       369      389.3      51.6        1.5
          333.00    1210      1008       666      961.3     275.0        3.8     *
         1000.00    2244      1867      2016     2042.3     189.9        8.0
         3333.00    2415      2262      2289     2322.0      81.7        9.1

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 040883    CHEMICAL: EC        ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100       BATCH: D073
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     272       213       275      253.3      35.0   NA   1.0
 P1 04      0.50     554       603       571      576.0      24.9    A   2.3
 P2 04      1.00    1422      1617      1467     1502.0     102.1    A   5.9
           33.00     182       201       158      180.3      21.5        0.7
          100.00     353       397       333      361.0      32.7        1.4
          333.00     514       797       506      605.7     165.7        2.4     *
         1000.00    2416      1460      1015     1630.3     715.9        6.4
         3333.00    2492      2417      2412     2440.3      44.8        9.6
```

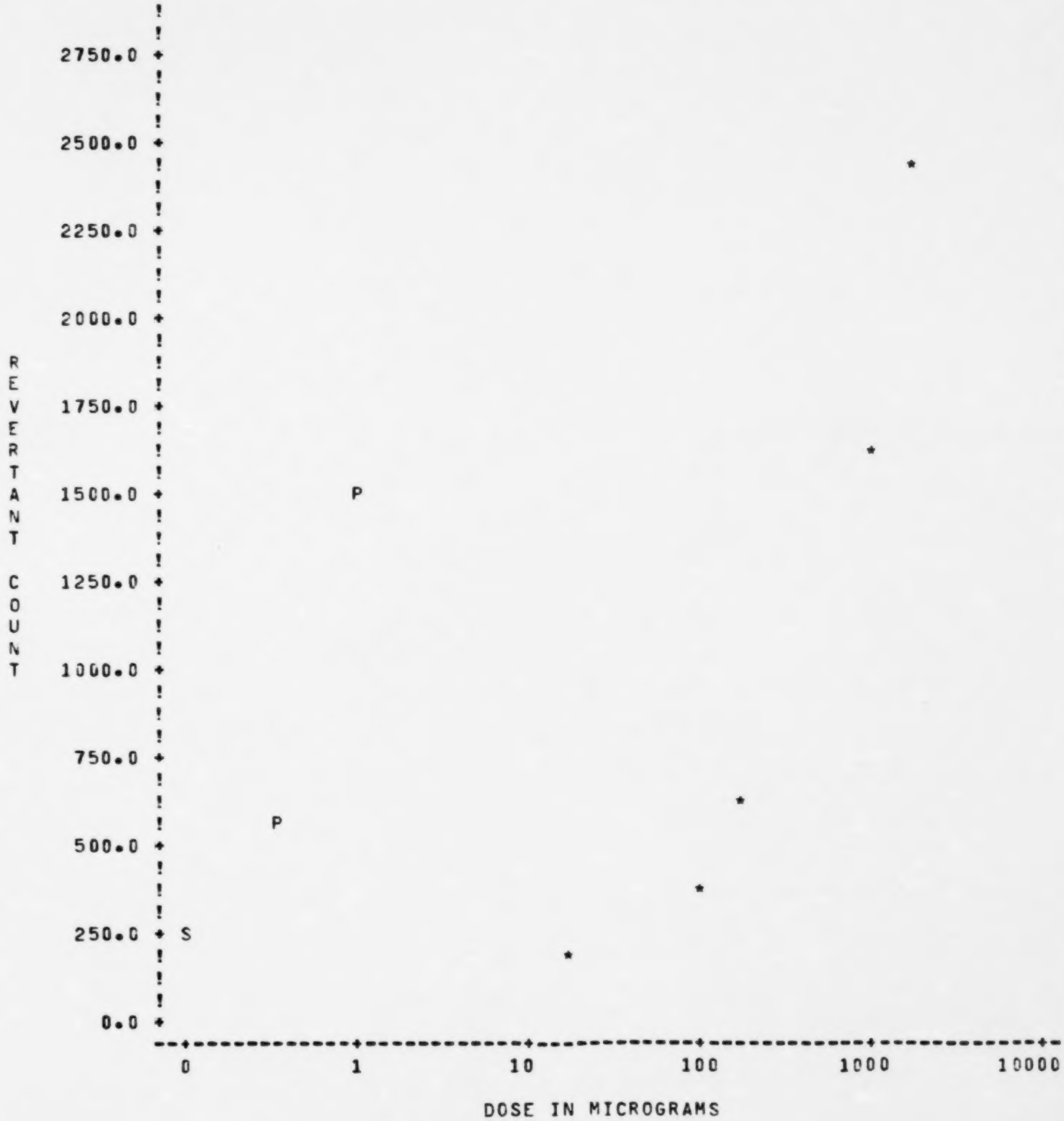
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=100   DATE=040883   ACTIV=     ACT%=05

            PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=100   DATE=040883   ACTIV=CSD001   ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



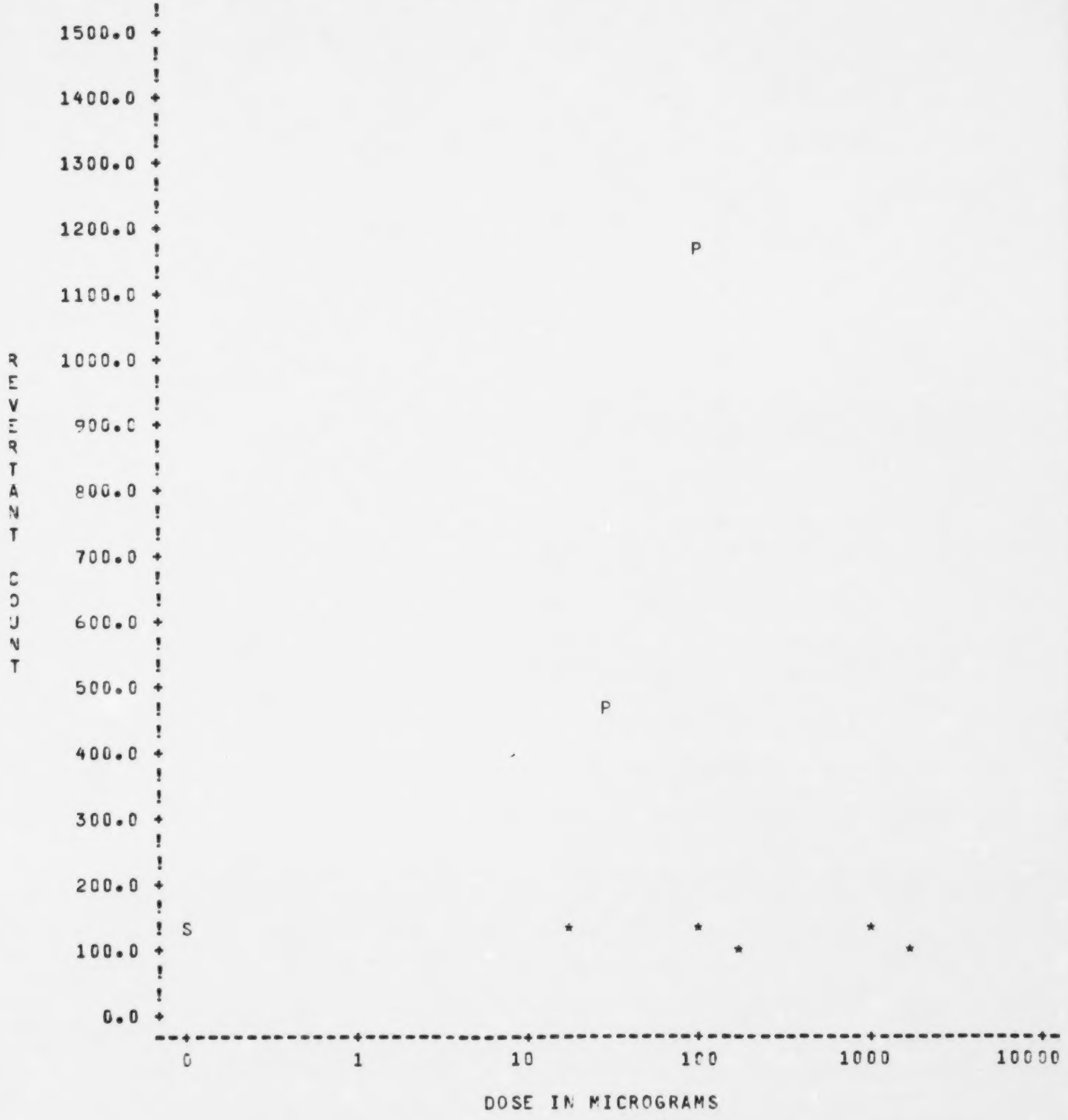
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EC   STRAIN=100   DATE=040883   ACTIV=HEPA01   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



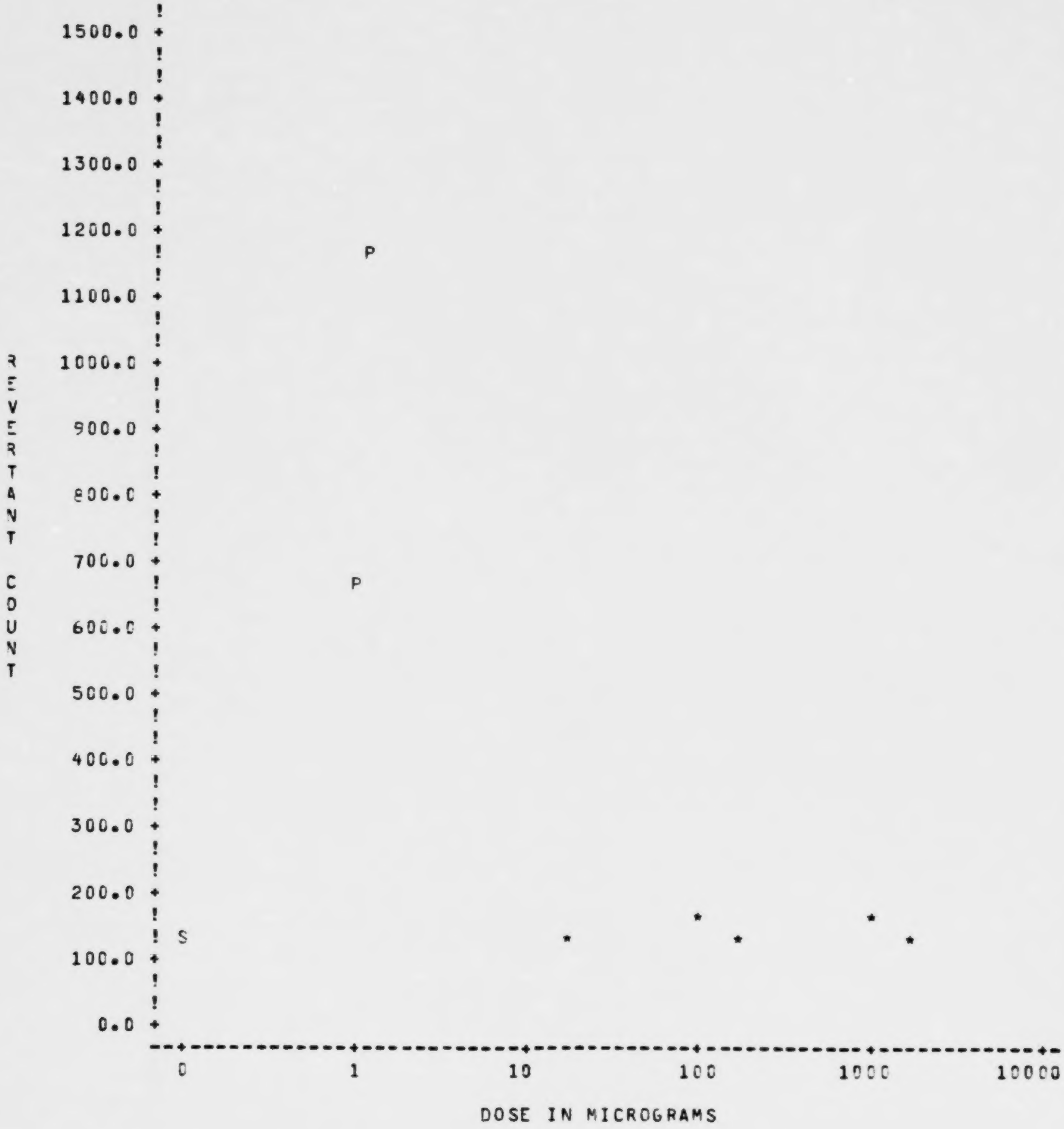
MUTAGENICITY OF NP - TA97

```
M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042883     CHEMICAL: NP               ACTIVATION:
TEST TYPE: 05        STRAIN: TA97               BATCH: D273
DILUTION=   :        PLATED=                    COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     132       124       115      123.7       8.5    A   1.0
 P1 02     50.00     562       473       346      460.3     108.6    A   3.7
 P2 02    100.00    1222       851      1393     1155.3     277.1    A   9.3
           33.00     142       113        98      117.7      22.4        1.0
          100.00     128       120       122      123.3       4.2        1.0
          333.00      96       117        95      102.7      12.4        0.8
         1000.00     120        96       138      118.0      21.1        1.0
         3333.00      96       125       106      109.0      14.7        0.9

M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042883     CHEMICAL: NP               ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97               BATCH: D273
DILUTION=  1: 20     PLATED= 100                COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     134       124       129      129.0       5.0    A   1.0
 P1 04      1.00     599       699       716      671.3      63.2    A   5.2
 P2 04      2.00    1068      1257      1149     1158.0      94.8    A   9.0
           33.00     155       145       144      148.0       6.1        1.1
          100.00     188       150       118      152.0      35.0        1.2
          333.00     138       133       147      139.3       7.1        1.1
         1000.00     190       146       153      163.0      23.6        1.3
         3333.00     136       144       138      139.3       4.2        1.1

M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042883     CHEMICAL: NP               ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97               BATCH: D273
DILUTION=  1: 20     PLATED= 100                COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     140       119       151      136.7      16.3    A   1.0
 P1 04      0.50     498       386       523      469.0      73.0    A   3.4
 P2 04      1.00    1023       990      1086     1033.0      48.8    A   7.6
           33.00     149       140       180      156.3      21.0        1.1
          100.00     183       143       158      161.3      20.2        1.2
          333.00     203       142       155      166.7      32.1        1.2
         1000.00     151       134       122      135.7      14.6        1.0
         3333.00     170       156       163      163.0       7.0        1.2
```

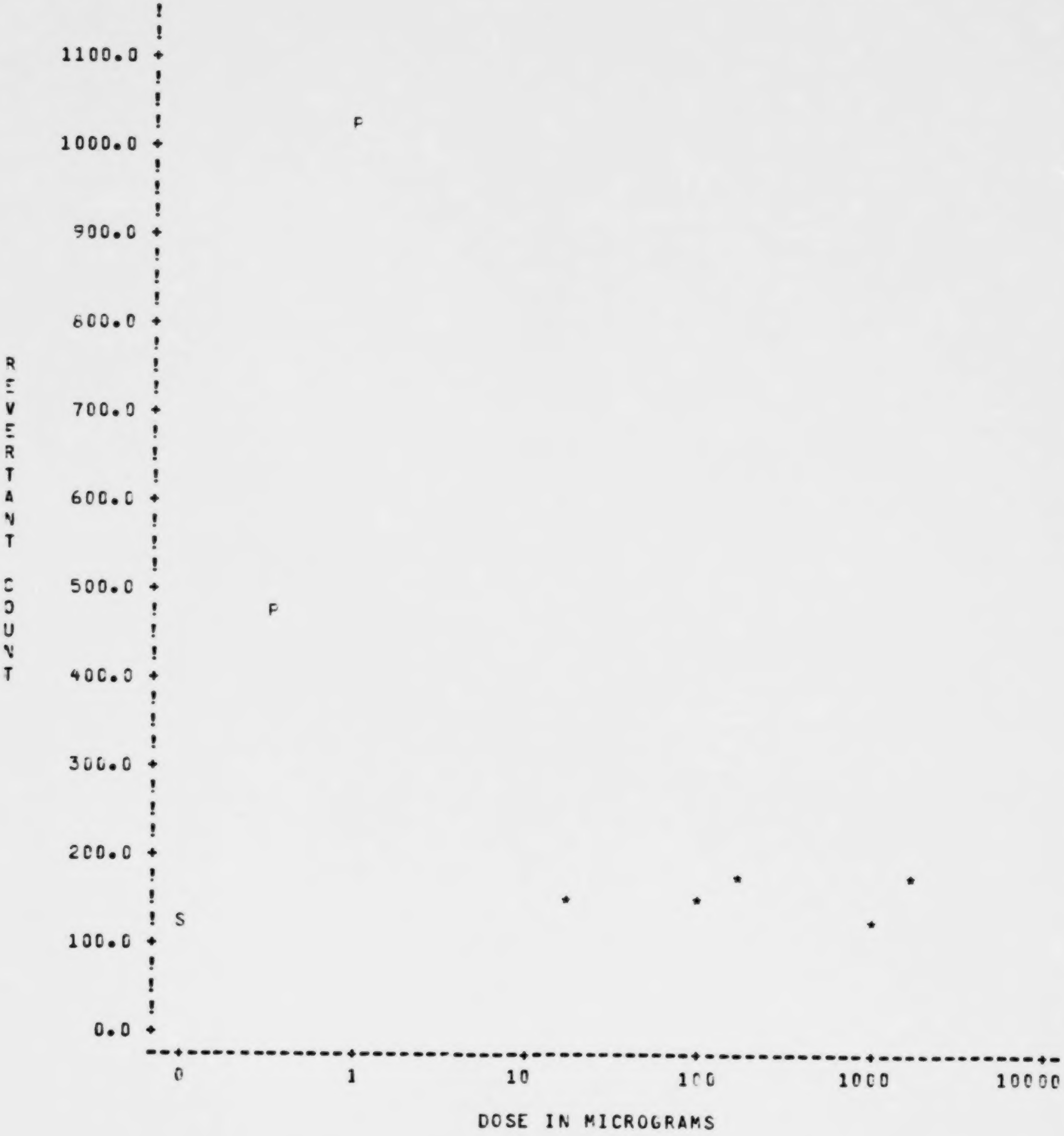
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=97   DATE=042883   ACTIV=     ACTX=05

PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=97   DATE=042883   ACTIV=CSD002   ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

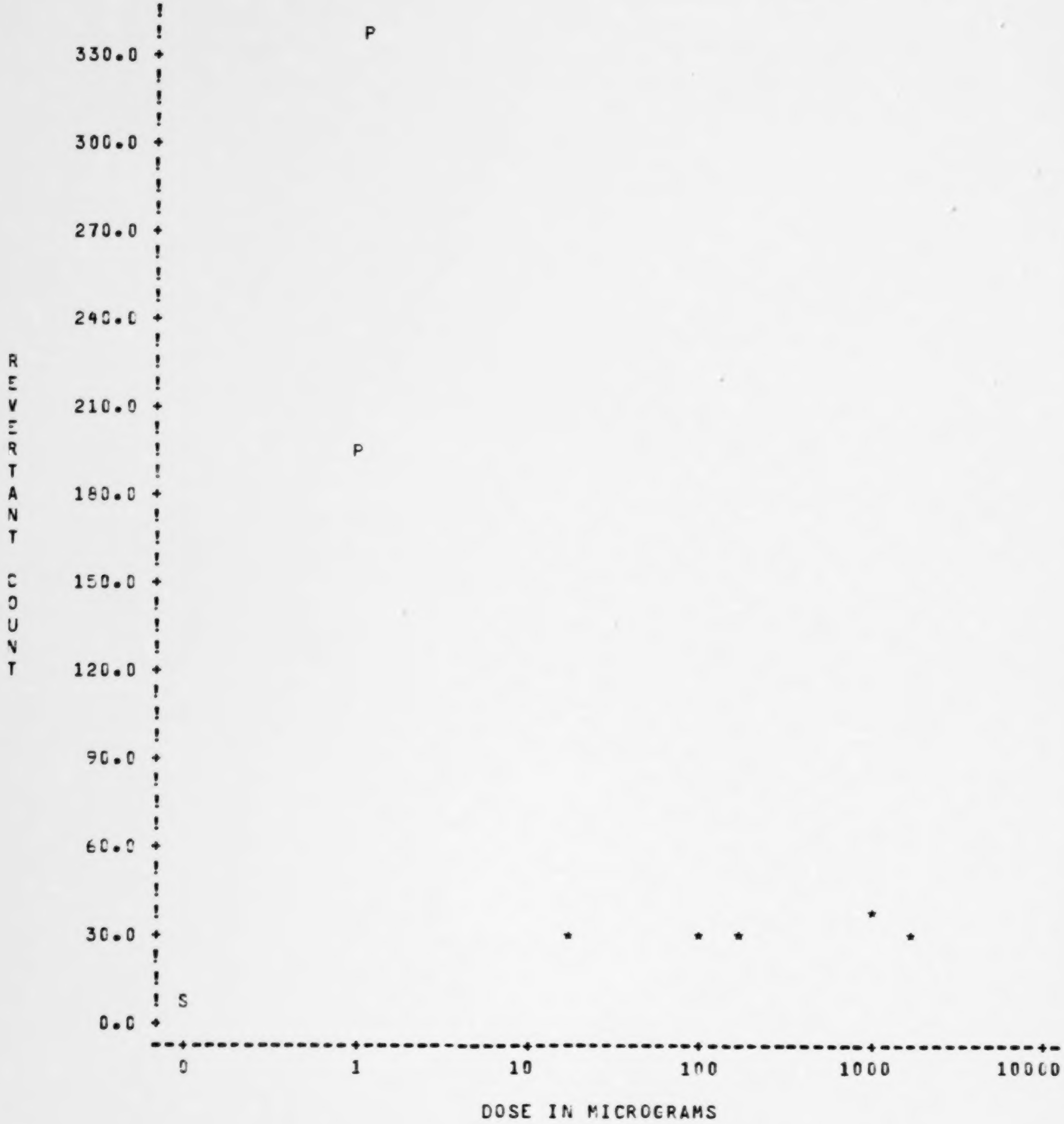


```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=97   DATE=042883   ACTIV=HEPA01   ACT%=05

               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

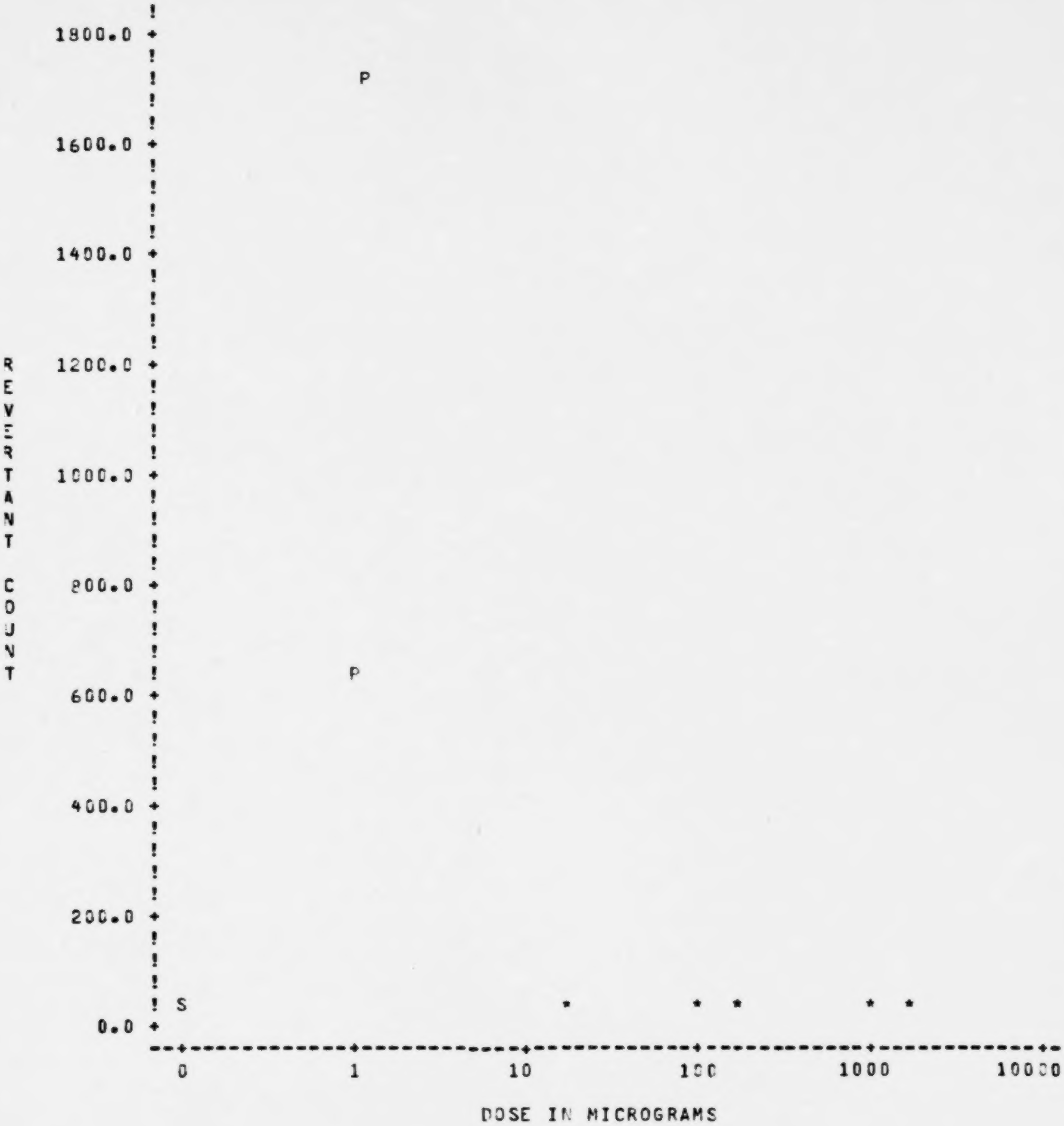


```
                          MUTAGENICITY OF NP  - TA98

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NP              ACTIVATION:
TEST TYPE: 05       STRAIN: TA98              BATCH: D273
DILUTION=   :       PLATED=                   COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     13         14          4       10.3       5.5   NA   1.0
 P1 03      1.00    214        192        171      192.3      21.5    A  18.7
 P2 03      2.00    346        343        321      336.7      13.7    A  32.7
           33.00     39         28         34       33.7       5.5         3.3   *
          100.00     39         23         36       32.7       8.5         3.2
          333.00     30         26         28       28.0       2.0         2.7
         1000.00     44         27         39       36.7       8.7         3.6
         3333.00     43         33         24       33.3       9.5         3.2

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NP              ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98              BATCH: D273
DILUTION=  1: 20    PLATED= 100               COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     30         42         42       38.0       6.9    A   1.0
 P1 04      1.00    622        670        682      658.0      31.7    A  17.3
 P2 04      2.00   1686       1661       1794     1713.7      70.7    A  45.1
           33.00     42         38         41       40.3       2.1         1.1
          100.00     52         37         28       39.0      12.1         1.0
          333.00     35         37         35       35.7       1.2         0.9
         1000.00     33         33         30       32.0       1.7         0.8
         3333.00     49         45         49       47.7       2.3         1.3

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NP              ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98              BATCH: D273
DILUTION=  1: 20    PLATED= 100               COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     43         40         31       38.0       6.2    A   1.0
 P1 04      0.50    407        574        607      529.3     107.2    A  13.9
 P2 04      1.00   1351       1213       1747     1437.0     277.2    A  37.8
           33.00     45         40         46       44.3       4.0         1.2
          100.00     42         58         37       45.7      11.0         1.2
          333.00     36         50         49       45.0       7.8         1.2
         1000.00     42         44         43       43.0       1.0         1.1
         3333.00     34         49         47       43.3       8.1         1.1
```

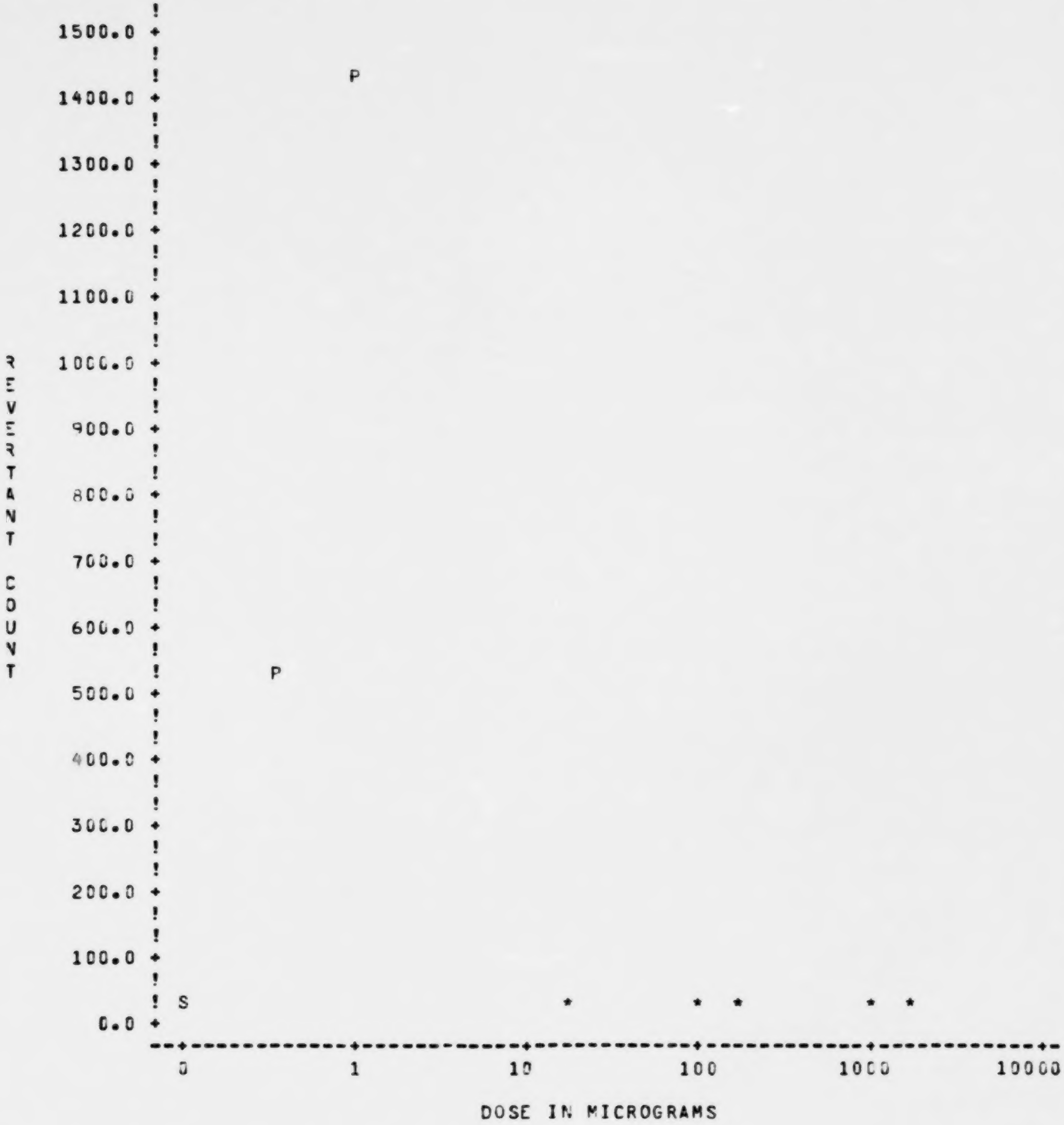
```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=98   DATE=042883   ACTIV=    ACT%=05

          PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=98   DATE=042883   ACTIV=CSD002   ACTX=05

           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

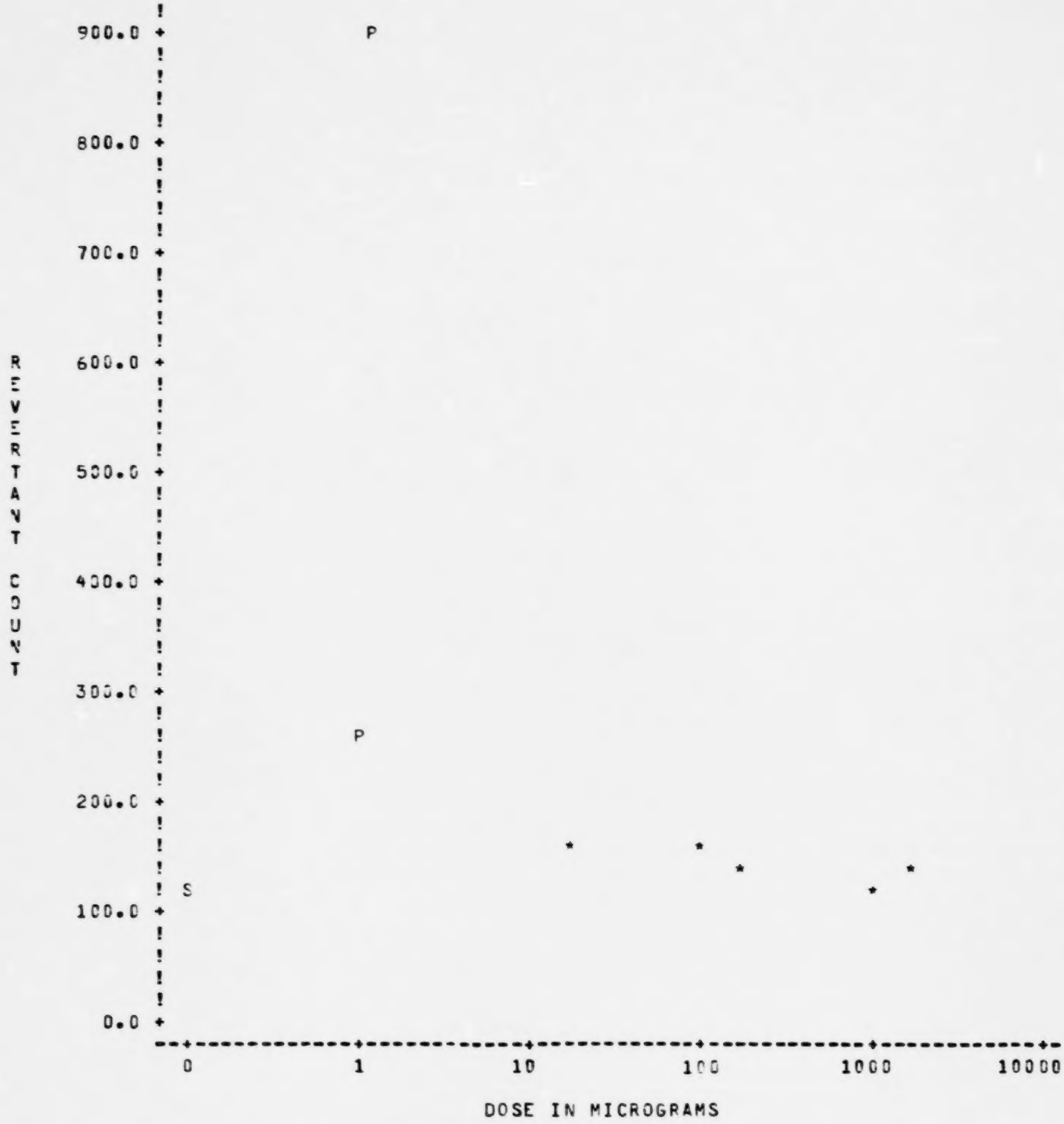


```
            S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=98   DATE=042883   ACTIV=HEPA01   ACTX=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

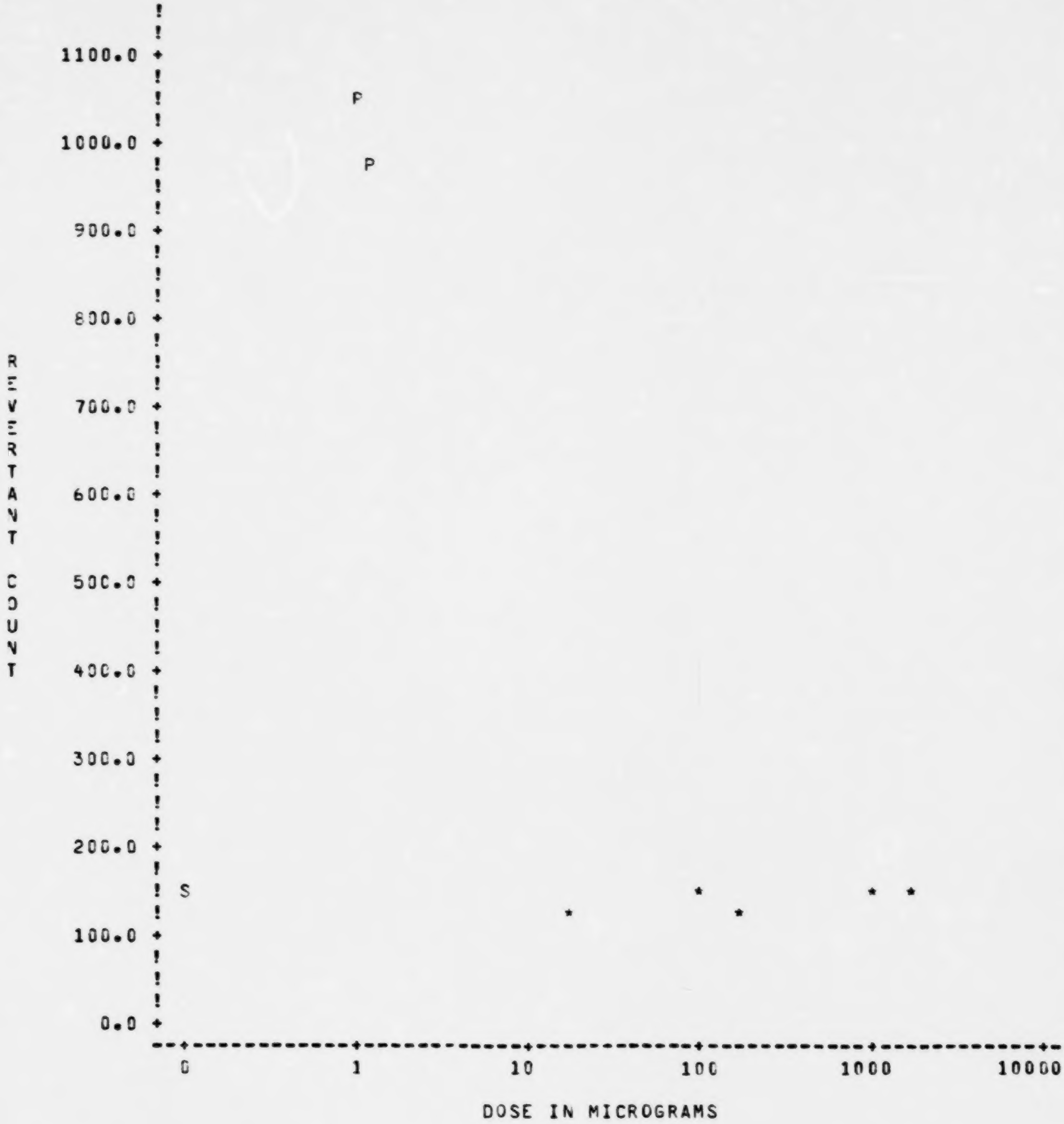


```
                          MUTAGENICITY OF NP  - TA100

M U T A G E N I C I T Y                    CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NP           ACTIVATION:
TEST TYPE: 05       STRAIN: TA100          BATCH: D273
DILUTION=   :       PLATED=                COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     114       113       123      116.7       5.5    A    1.0
 P1 01      1.00     355       289       127      257.0     117.3    A    2.2
 P2 01      2.00     920       877       913      903.3      23.1    A    7.7
           33.00     177       163       156      165.3      10.7         1.4
          100.00     158       143       153      151.3       7.6         1.3
          333.00     150       136       145      143.7       7.1         1.2
         1000.00     119       140       120      126.3      11.8         1.1
         3333.00     143       125       144      137.3      10.7         1.2

M U T A G E N I C I T Y                    CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NP           ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100          BATCH: D273
DILUTION=  1: 20    PLATED= 100            COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     131       171       142      148.0      20.7    A    1.0
 P1 04      1.00    1096      1121       919     1045.3     110.1    A    7.1
 P2 04      2.00    1619       814       517      983.3     570.2    A    6.6
           33.00     137       125       111      124.3      13.0         0.8
          100.00     152       150       132      144.7      11.0         1.0
          333.00     140       131       122      131.0       9.0         0.9
         1000.00     146       152       142      146.7       5.0         1.0
         3333.00     166       152       136      151.3      15.0         1.0

M U T A G E N I C I T Y                    CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NP           ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100          BATCH: D273
DILUTION=  1: 20    PLATED= 100            COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     163       180       131      158.0      24.9    A    1.0
 P1 04      0.50    1186      1049       983     1072.7     103.5    A    6.8
 P2 04      1.00    2226      2004      2287     2172.3     148.9    A   13.7
           33.00     197       186       191      191.3       5.5         1.2
          100.00     146       182       185      171.0      21.7         1.1
          333.00     339       220       205      254.7      73.4         1.6
         1000.00     161       176       155      164.0      10.8         1.0
         3333.00     227       180       199      202.0      23.6         1.3
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=100   DATE=042883   ACTIV=    ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

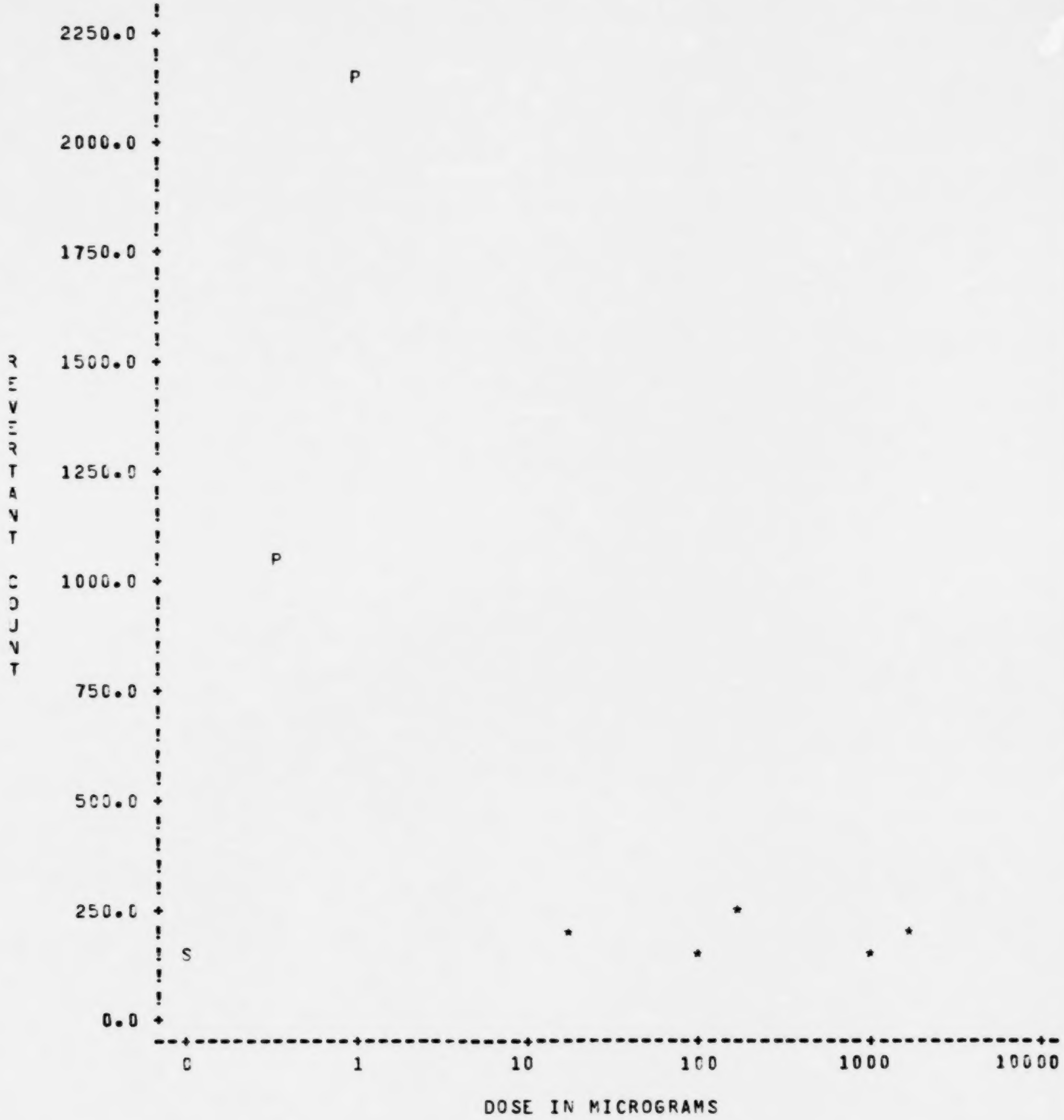


```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=100   DATE=042883   ACTIV=CSD002   ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
    S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NP   STRAIN=100   DATE=042883   ACTIV=HEPA01   ACT%=05
```

PLOT OF AVGCOUNT*DOSE   SYMBOL IS VALUE OF SPIND

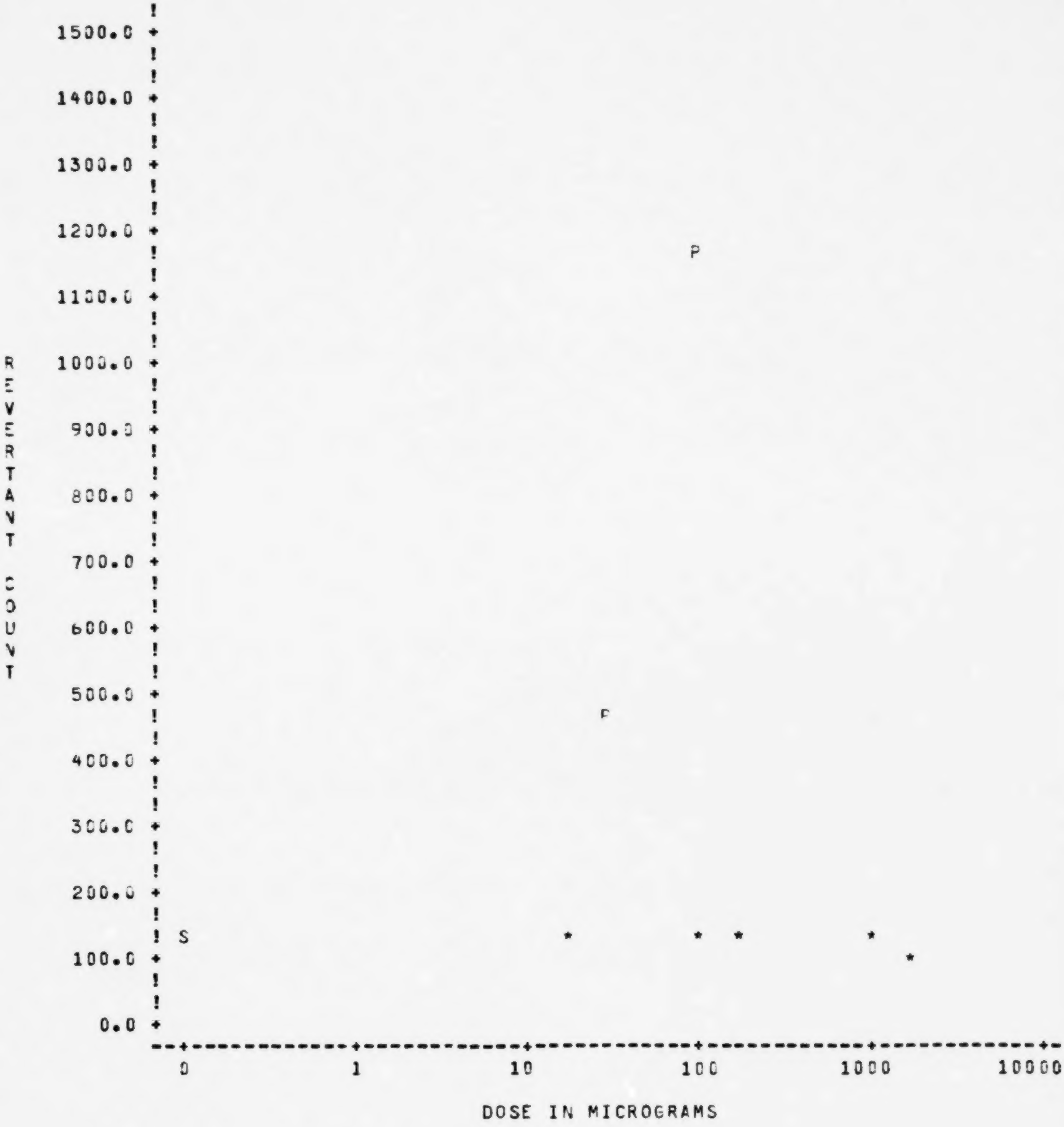


MUTAGENICITY OF NB - TA97

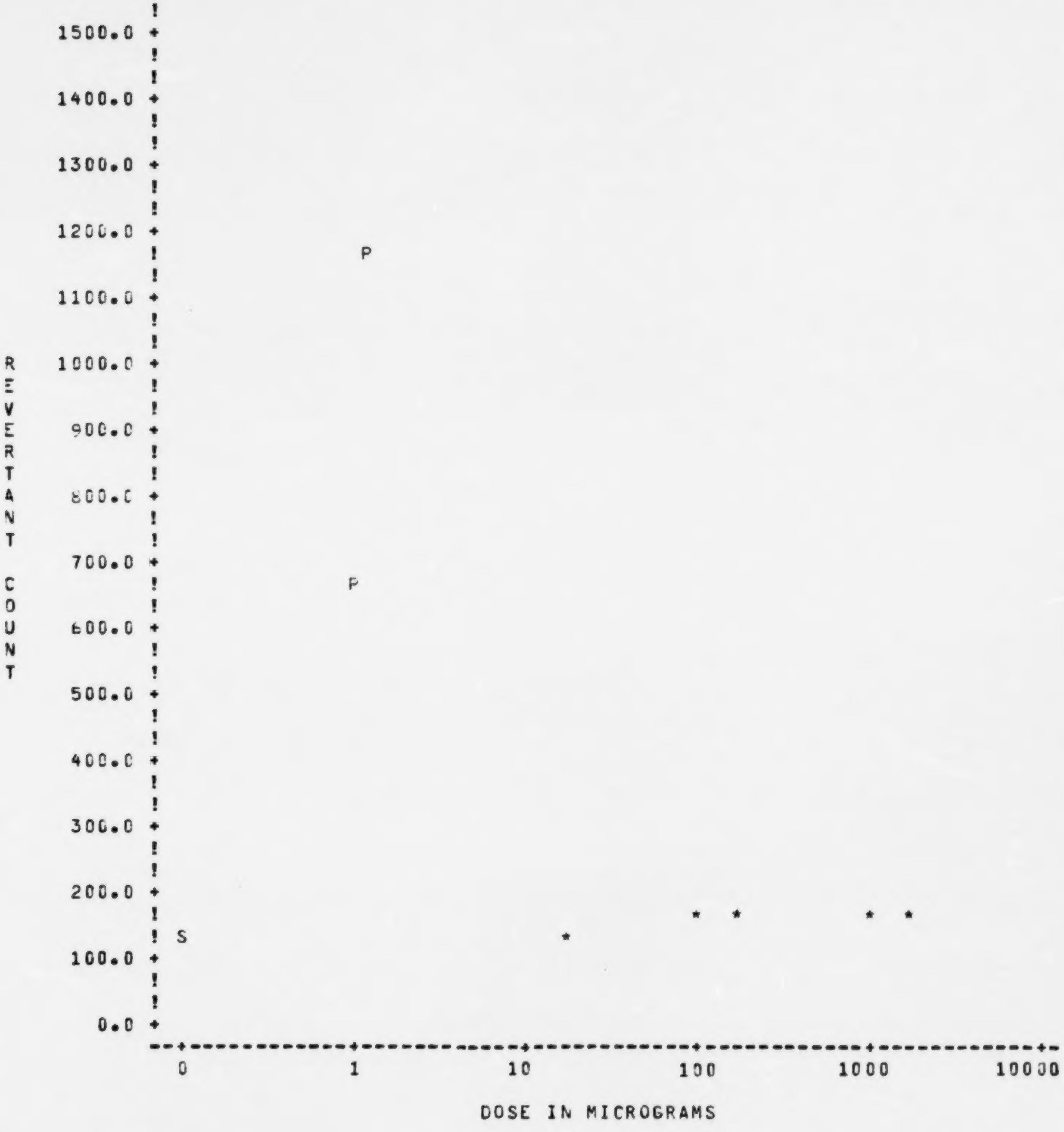
```
M U T A G E N I C I T Y                             CONTRACT NO.: 191482
EXP DATE: 042883     CHEMICAL: NB                   ACTIVATION:
TEST TYPE: 05        STRAIN: TA97                   BATCH: D273
DILUTION=   :        PLATED=                        COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     132       124       115       123.7      8.5     A   1.0
 P1 02     50.00     562       473       346       460.3    108.6     A   3.7
 P2 02    100.00    1222       851      1393      1155.3    277.1     A   9.3
           33.00     128       145       131       134.7      9.1         1.1
          100.00     143       144       130       139.0      7.8         1.1
          333.00     120       148       135       134.3     14.0         1.1
         1000.00     138       139       145       140.7      3.8         1.1
         3333.00     115        78        77        90.0     21.7         0.7


M U T A G E N I C I T Y                             CONTRACT NO.: 191482
EXP DATE: 042883     CHEMICAL: NB                   ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97                   BATCH: D273
DILUTION=  1: 20     PLATED= 100                    COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     134       124       129       129.0      5.0     A   1.0
 P1 04      1.00     599       699       716       671.3     63.2     A   5.2
 P2 04      2.00    1068      1257      1149      1158.0     94.8     A   9.0
           33.00     154       152       133       146.3     11.6         1.1
          100.00     145       185       189       173.0     24.3         1.3
          333.00     169       174       179       174.0      5.0         1.3
         1000.00     171       175       163       169.7      6.1         1.3
         3333.00     150       170       165       161.7     10.4         1.3

M U T A G E N I C I T Y                             CONTRACT NO.: 191482
EXP DATE: 042883     CHEMICAL: NB                   ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97                   BATCH: D273
DILUTION=  1: 20     PLATED= 100                    COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   Q/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     140       119       151       136.7     16.3     A   1.0
 P1 04      0.50     498       386       523       469.0     73.0     A   3.4
 P2 04      1.00    1023       990      1086      1033.0     48.8     A   7.6
           33.00     166       183       153       167.3     15.0         1.2
          100.00     142       167       181       163.3     19.8         1.2
          333.00     171       152       150       157.7     11.6         1.2
         1000.00     146       138       135       139.7      5.7         1.0
         3333.00
```

S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482 CHEM=NB STRAIN= 97 DATE=042883 ACTIV= ACT%=05

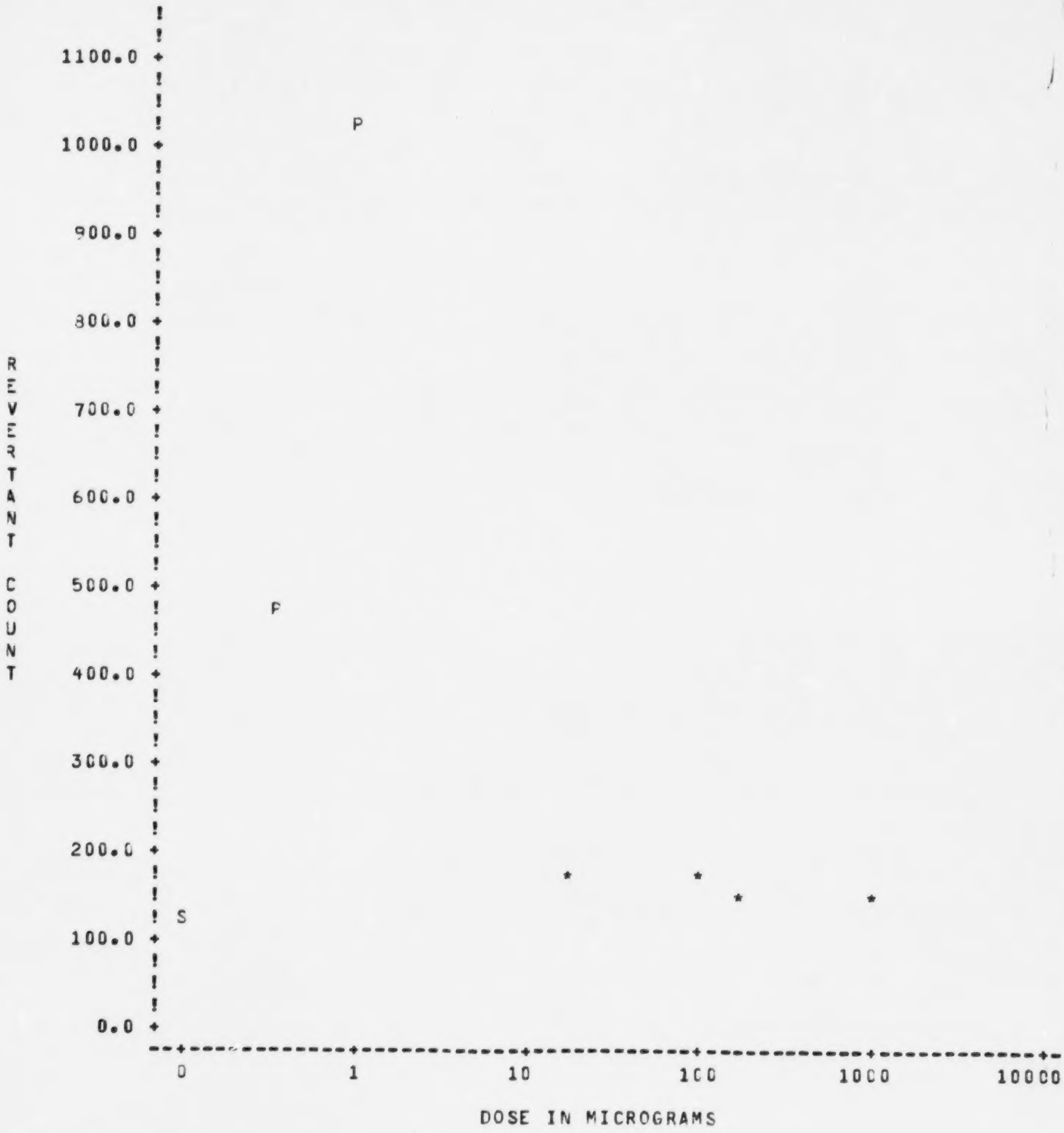
PLOT OF AVGCOUNT*DOSE SYMBOL IS VALUE OF SPIND



```
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NB   STRAIN=97   DATE=042883   ACTIV=CSD002   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NB   STRAIN=97   DATE=042883   ACTIV=HEPA01   ACT%=05

               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

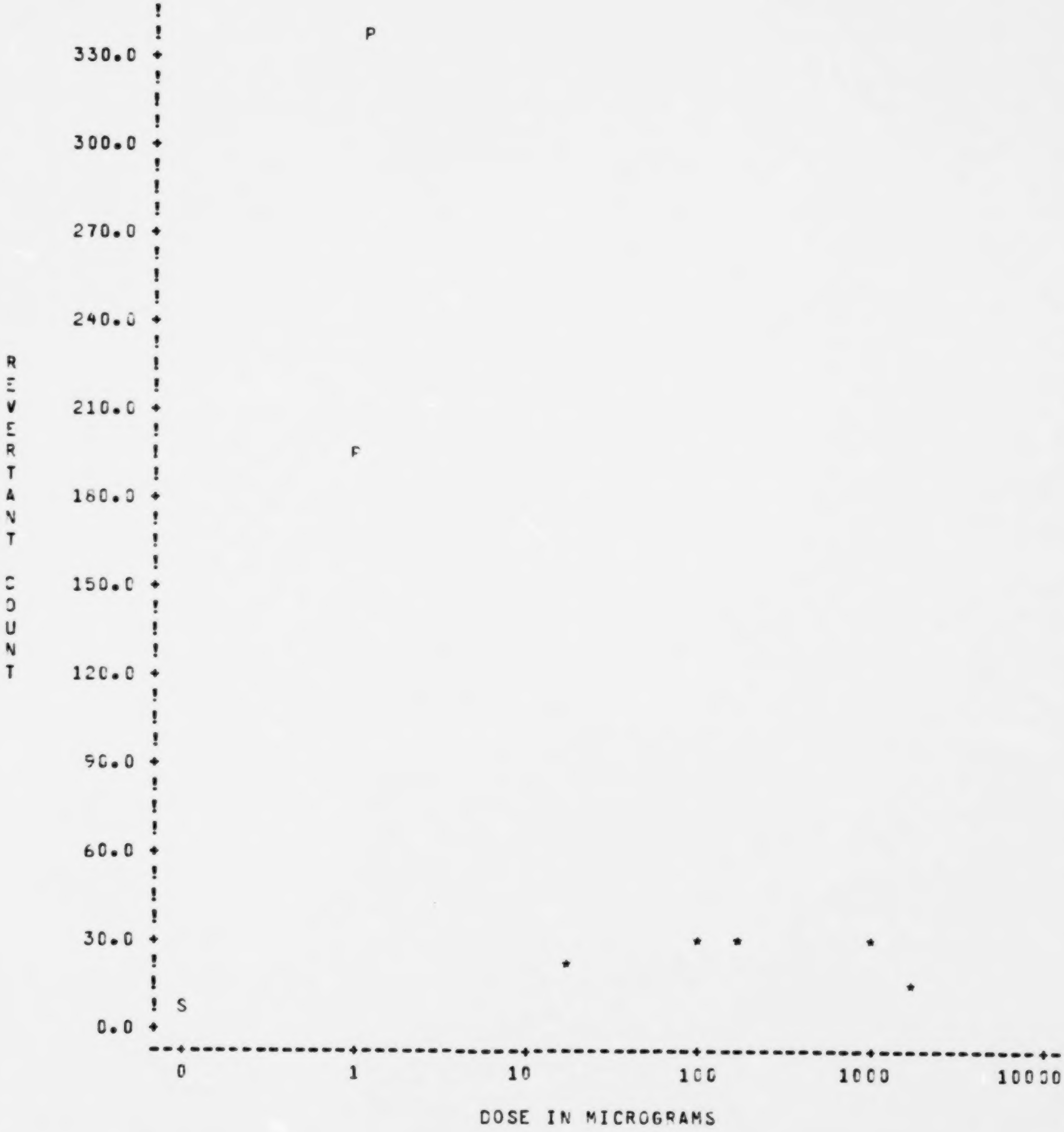


```
NOTE:      1 OBS HAD MISSING VALUES OR WERE OUT OF RANGE
```

MUTAGENICITY OF NB - TA98

```
M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NB          ACTIVATION:
TEST TYPE: 05       STRAIN: TA98          BATCH: D273
DILUTION=   :       PLATED=               COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     13        14         4       10.3       5.5    NA   1.0
 P1 03      1.00    214       192       171      192.3      21.5     A  18.7
 P2 03      2.00    346       343       321      336.7      13.7     A  32.7
           33.00     26        31        20       25.7       5.5          2.5     *
          100.00     31        39        31       33.7       4.6          3.3
          333.00     32        27        29       29.3       2.5          2.8
         1000.00     32        32        32       32.0       0.0          3.1
         3333.00     20         7        29       18.7      11.1          1.8

M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NB          ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98          BATCH: D273
DILUTION=  1: 20    PLATED= 100           COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     30        42        42       38.0       6.9     A   1.0
 P1 04      1.00    622       670       682      658.0      31.7     A  17.3
 P2 04      2.00   1686      1661      1794     1713.7      70.7     A  45.1
           33.00     42        41        38       40.3       2.1          1.1
          100.00     45        50        36       43.7       7.1          1.2
          333.00     47        36        46       43.0       6.1          1.1
         1000.00     49        30        49       42.7      11.0          1.1
         3333.00     38        44        45       42.3       3.8          1.1

M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NB          ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98          BATCH: D273
DILUTION=  1: 20    PLATED= 100           COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     43        40        31       38.0       6.2     A   1.0
 P1 04      0.50    407       574       607      529.3     107.2     A  13.9
 P2 04      1.00   1351      1213      1747     1437.0     277.2     A  37.8
           33.00     46        32        27       35.0       9.8          0.9
          100.00     42        54        42       46.0       6.9          1.2
          333.00     47        32        39       39.3       7.5          1.0
         1000.00     31        42        25       32.7       8.6          0.9
         3333.00     28        35        42       35.0       7.0          0.9
```

```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NB   STRAIN=98   DATE=042883   ACTIV=    ACT%=05

            PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

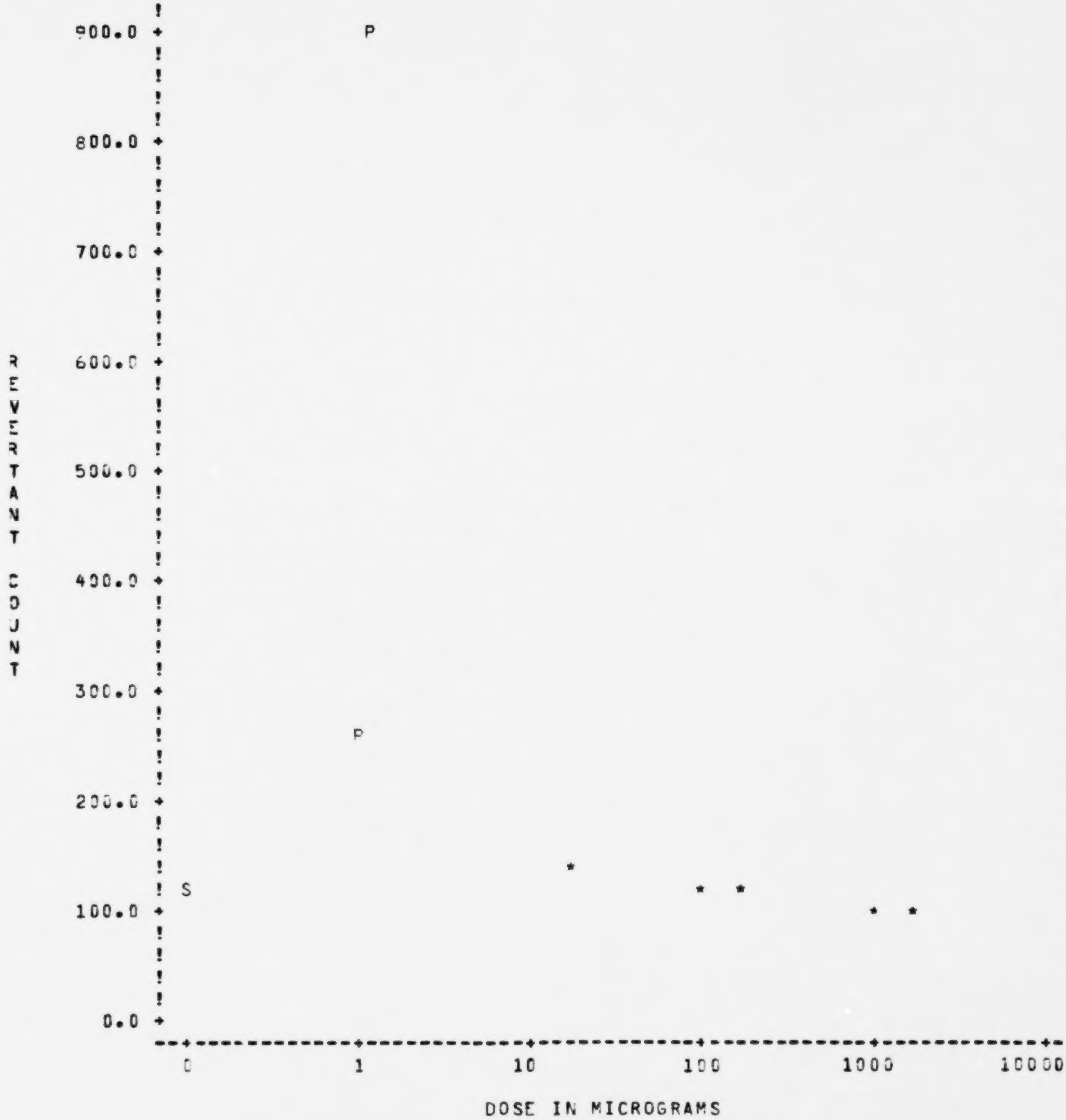


```
           S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=NB   STRAIN=98   DATE=042883   ACTIV=CSD002   ACT%=05

                  PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1800.0 +
           !
           !              P
           !
           !
    1600.0 +
           !
           !
           !
           !
    1400.0 +
           !
           !
           !
           !
R   1200.0 +
E          !
V          !
E          !
R          !
T   1000.0 +
A          !
N          !
T          !
           !
C    800.0 +
O          !
U          !
N          !
T          !             P
     600.0 +
           !
           !
           !
           !
     400.0 +
           !
           !
           !
           !
     200.0 +
           !
           !
           !
           ! S                           *         *  *        *  *
       0.0 +
          ---+-----------+------------+------------+-----------+------------+-
             0           1           10.          100         1000       10000

                                   DOSE IN MICROGRAMS
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
   CON=191482   CHEM=NB   STRAIN=98   DATE=042883   ACTIV=HEPA01   ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

          !
   1500.0 +
          !
          !             P
   1400.0 +
          !
          !
   1300.0 +
          !
          !
   1200.0 +
          !
          !
   1100.0 +
          !
          !
R  1000.0 +
E         !
V         !
E   900.0 +
R         !
T         !
A   800.0 +
N         !
T         !
    700.0 +
C         !
O         !
U   600.0 +
N         !
T         !       P
    500.0 +
          !
          !
    400.0 +
          !
          !
    300.0 +
          !
          !
    200.0 +
          !
          !
    100.0 +
          !
          ! S                          *        *  *        *  *
      0.0 +
          --+-----------+-----------+-----------+-----------+-----------+-
            0           1          10          100         1000        10000

                                DOSE IN MICROGRAMS
```

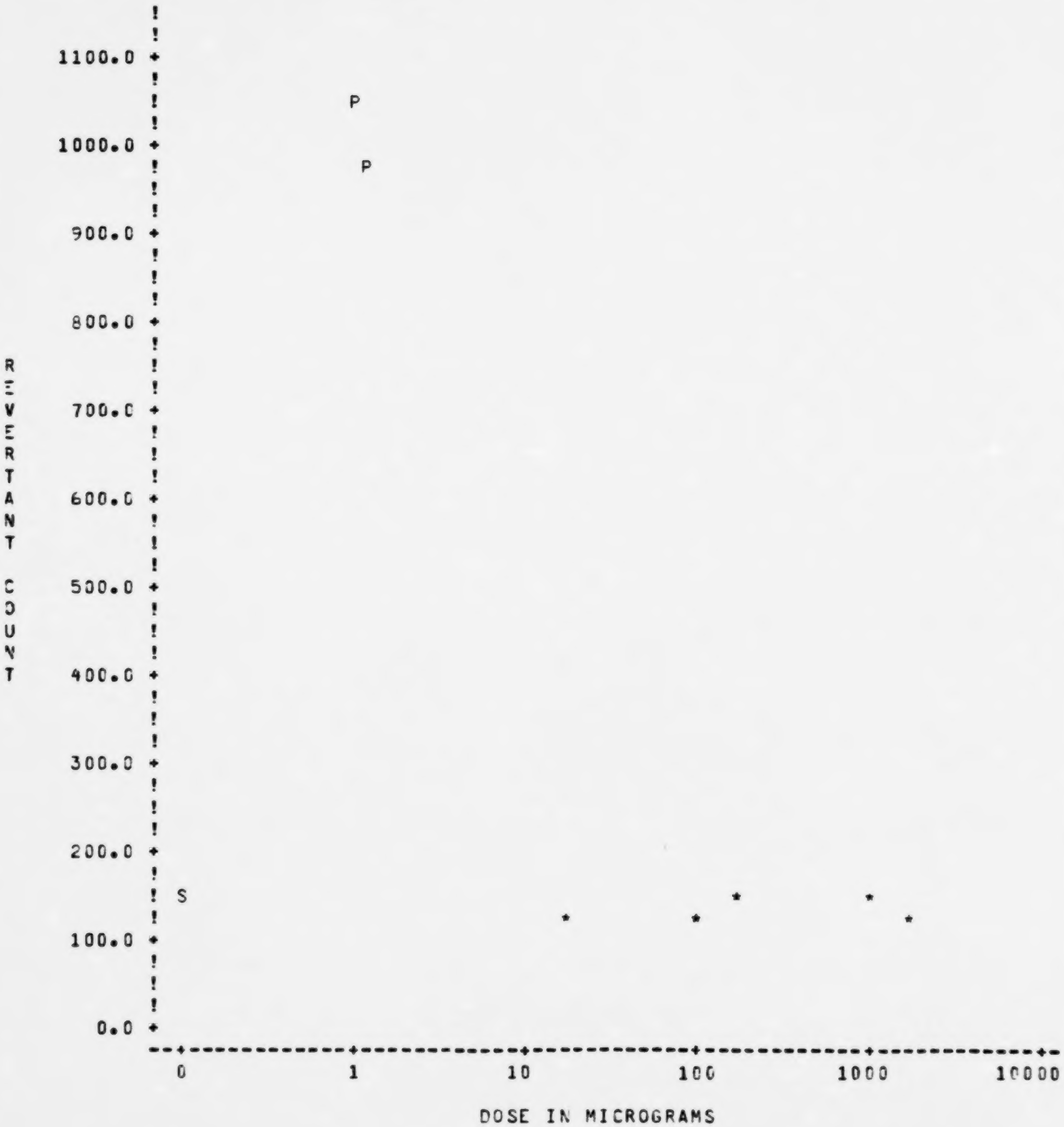
MUTAGENICITY OF NB - TA100

```
M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NB        ACTIVATION:
TEST TYPE: 05       STRAIN: TA100       BATCH: D273
DILUTION=   :       PLATED=             COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     114       113       123       116.7      5.5    A    1.0
 P1 01      1.00     355       289       127       257.0    117.3    A    2.2
 P2 01      2.00     920       877       913       903.3     23.1    A    7.7
           33.00     134       133       135       134.0      1.0         1.1
          100.00      96       127       152       125.0     28.1         1.1
          333.00     111       153       109       124.3     24.8         1.1
         1000.00      91        95        98        94.7      3.5         0.8
         3333.00     113       108        99       106.7      7.1         0.9

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NB        ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100       BATCH: D273
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     131       171       142       148.0     20.7    A    1.0
 P1 04      1.00    1096      1121       919      1045.3    110.1    A    7.1
 P2 04      2.00    1619       814       517       983.3    570.2    A    6.6
           33.00     116       130       135       127.0      9.8         0.9
          100.00     112       115       127       118.0      7.9         0.8
          333.00     137       126       193       152.0     35.9         1.0
         1000.00     155       138       142       145.0      8.9         1.0
         3333.00     124       127       137       129.3      6.8         0.9

M U T A G E N I C I T Y                 CONTRACT NO.: 191482
EXP DATE: 042883    CHEMICAL: NB        ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100       BATCH: D273
DILUTION=  1: 20    PLATED= 100         COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 99      0.00     163       180       131       158.0     24.9    A    1.0
 P1 04      0.50    1186      1049       983      1072.7    103.5    A    6.8
 P2 04      1.00    2226      2004      2287      2172.3    148.9    A   13.7
           33.00     128       134       119       127.0      7.5         0.8
          100.00     147       129       126       134.0     11.4         0.8
          333.00     130       136       123       129.7      6.5         0.8
         1000.00     124       112       123       119.7      6.7         0.9
         3333.00      78       119        87        94.7     21.5         0.6
```

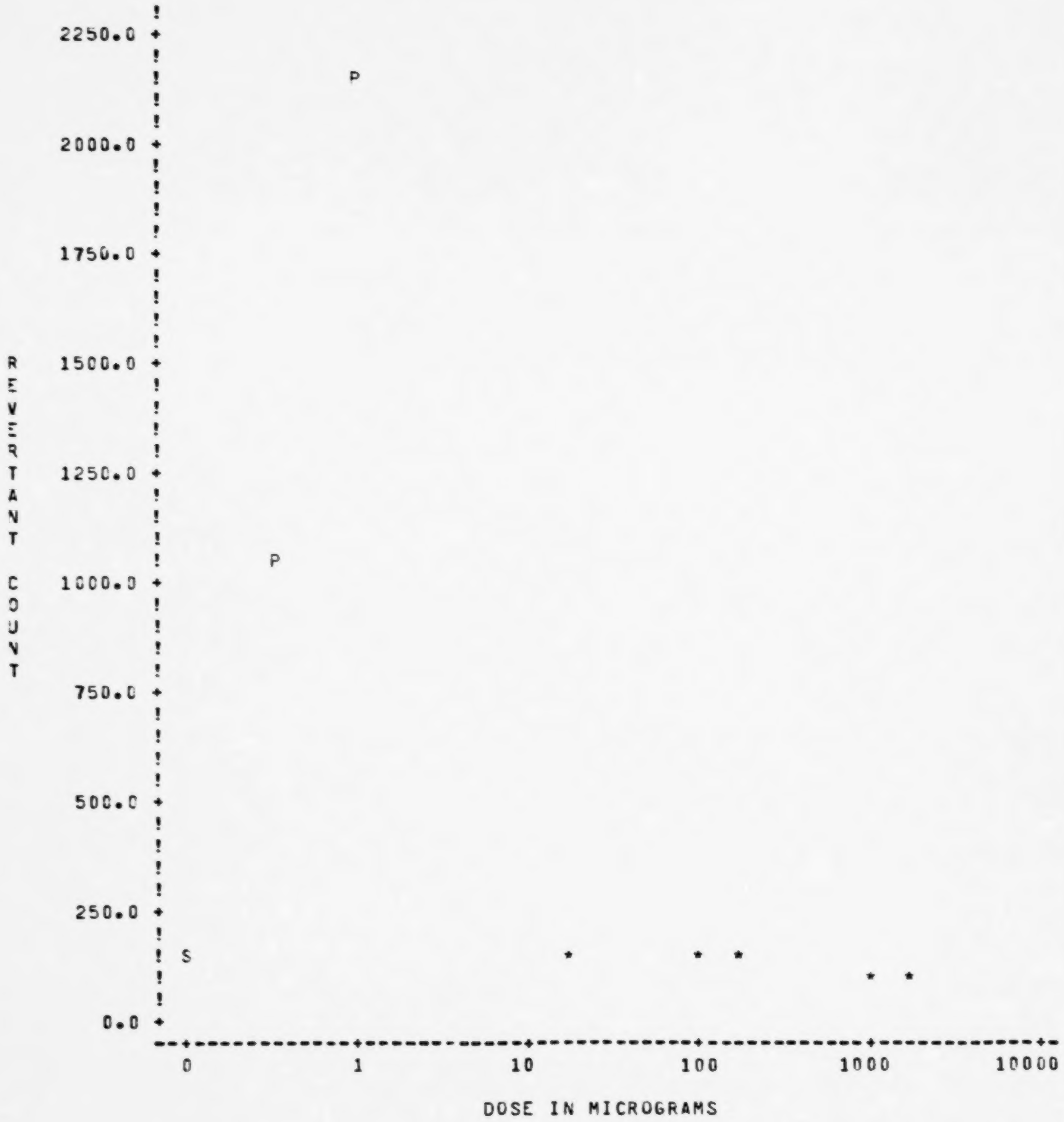
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NB   STRAIN=100   DATE=042883   ACTIV=    ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=NB   STRAIN=100   DATE=042883   ACTIV=CSD002   ACT%=05

                  PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191462   CHEM=NB   STRAIN=100   DATE=042883   ACTIV=HEPA01   ACTX=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF HS - TA97

```
M U T A G E N I C I T Y                            CONTRACT NO.: 191482
EXP DATE: 042083      CHEMICAL: HS                 ACTIVATION:
TEST TYPE: 05         STRAIN: TA97                 BATCH: D193
DILUTION=    :        PLATED=                      COLONIES=
MIXTURE=              TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55       0.00    140       129       181       150.0    27.4    A   1.0
 P1 02      50.00    429       433       414       425.3    10.0    A   2.8
 P2 02     100.00   1098      1106       997      1067.0    60.9    A   7.1
            17.00    150       153       152       151.7     1.5        1.0
            57.00    183       152       137       157.3    23.5        1.0
           175.00    142       136       161       146.3    13.1        1.0
           582.00    161       141        94       132.0    34.4        0.9
          1750.00     98        58       116        90.7    29.7        0.6

M U T A G E N I C I T Y                            CONTRACT NO.: 191482
EXP DATE: 042083      CHEMICAL: HS                 ACTIVATION: CSD002
TEST TYPE: 05         STRAIN: TA97                 BATCH: D193
DILUTION=  1: 20      PLATED= 100                  COLONIES=
MIXTURE= 500          TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55       0.00    177       160       181       172.7    11.2    A   1.0
 P1 04       1.00    586       685       703       658.0    63.0    A   3.8
 P2 04       2.00   1455      1187      1012      1218.0   223.1    A   7.1
            17.00    151       174       200       175.0    24.5        1.0
            57.00    154       177       164       165.0    11.5        1.0
           175.00    168       181       219       189.3    26.5        1.1
           582.00    204       198       177       193.0    14.2        1.1
          1750.00    196       203       175       191.3    14.6        1.1

M U T A G E N I C I T Y                            CONTRACT NO.: 191482
EXP DATE: 042083      CHEMICAL: HS                 ACTIVATION: HEPA01
TEST TYPE: 05         STRAIN: TA97                 BATCH: D193
DILUTION=  1: 20      PLATED= 100                  COLONIES=
MIXTURE= 500          TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55       0.00    192       174       193       186.3    10.7    A   1.0
 P1 04       0.50    793       857                 825.0    45.3    A   4.4
 P2 04       1.00   1031      1099      1265      1131.7   120.4    A   6.1
            17.00    159       132       139       143.3    14.0        0.8
            57.00    166       160       156       160.7     5.0        0.9
           175.00    167       150       114       143.7    27.1        0.8
           582.00    214       156       162       177.3    31.9        1.0
          1750.00    173       173       204       183.3    17.9        1.0
```

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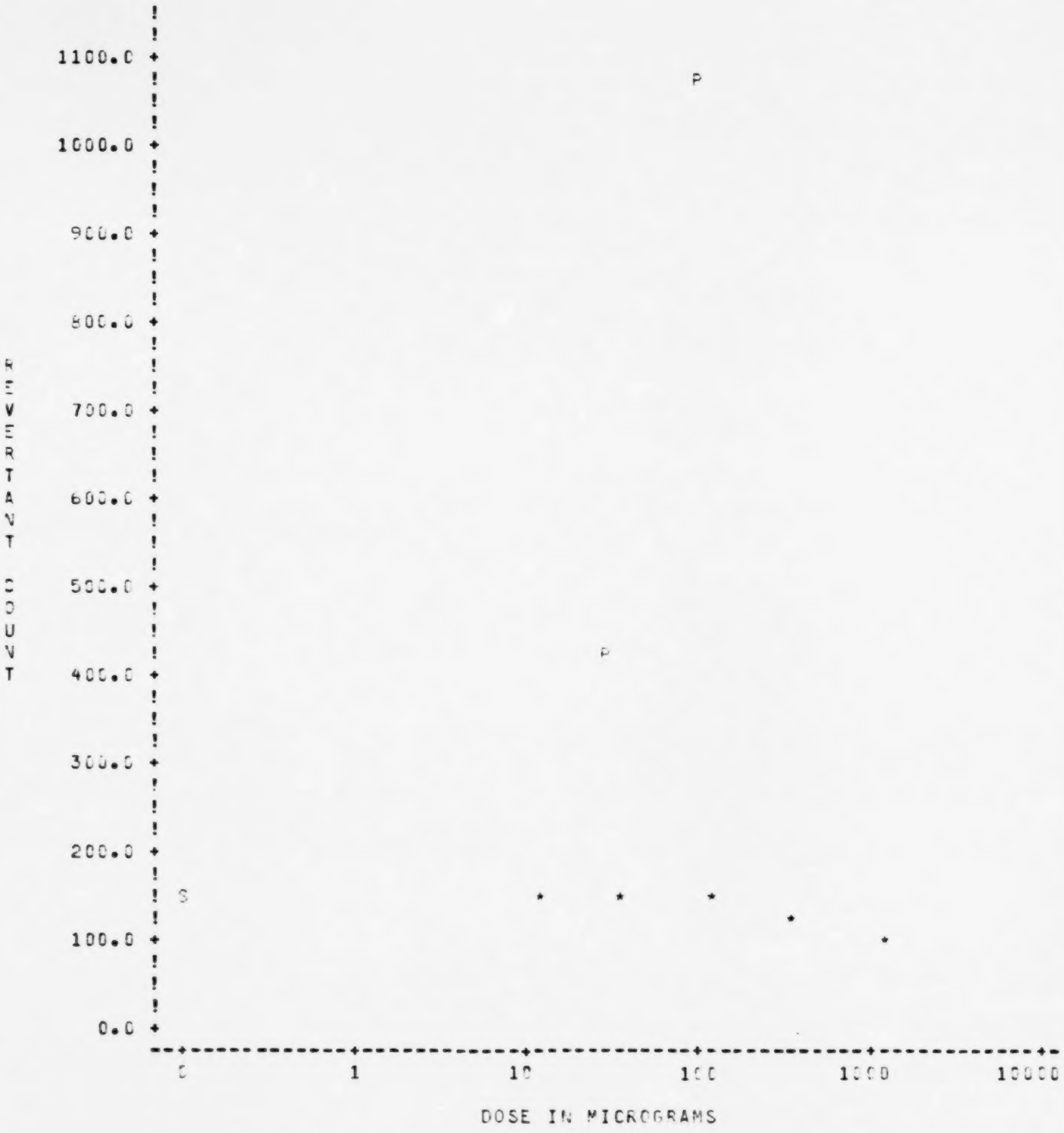
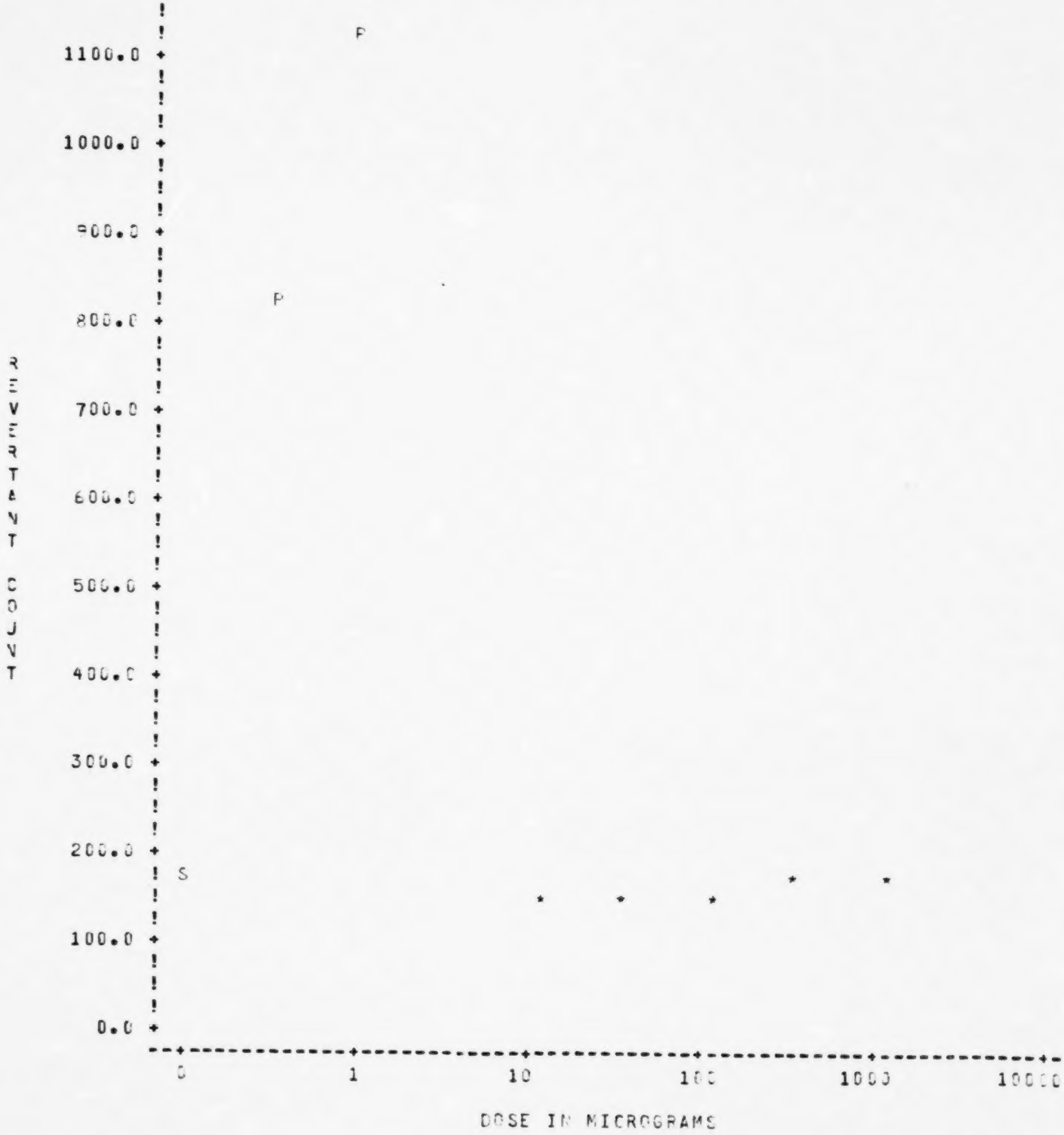
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=HS   STRAIN=97   DATE=042083   ACTIV=     ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
            S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=HS   STRAIN=97   DATE=042083   ACTIV=CSD002   ACTX=05

                    PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1500.0 +
           !
           !
    1400.0 +
           !
           !
    1300.0 +
           !
           !                P
    1200.0 +
           !
           !
    1100.0 +
           !
           !
R   1000.0 +
E          !
V          !
E    900.0 +
R          !
T          !
A    800.0 +
N          !
T          !
     700.0 +
C          !               P
O          !
U    600.0 +
N          !
T          !
     500.0 +
           !
           !
     400.0 +
           !
           !
     300.0 +
           !
           !
     200.0 +                                            *      *       *
           ! S                            *      *
           !
     100.0 +
           !
           !
       0.0 +
           --+-------------+-------------+-------------+-------------+-------------+-
             0             1             10           100          1000         10000

                                      DOSE IN MICROGRAMS
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=HS   STRAIN=97   DATE=042083   ACTIV=HEPA01   ACTX=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
                           MUTAGENICITY OF HS  - TA98

M U T A G E N I C I T Y                    CONTRACT NO.: 191482
EXP DATE: 042083    CHEMICAL: HS           ACTIVATION:
TEST TYPE: 05       STRAIN: TA98           BATCH: D193
DILUTION=   :       PLATED=                COLONIES=
MIXTURE=            TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00      21        20        20       20.3       0.6     A   1.0
 P1 04     1.00     197       252       107      185.3      73.2     A   9.1
 P2 04     2.00     334       322       343      333.0      10.5     A  16.4
          17.00      29        15        14       19.3       8.4         1.0
          57.00      12        23        15       16.7       5.7         0.8
         175.00      13        14        21       16.0       4.4         0.8
         582.00      16        16        19       17.0       1.7         0.8
        1750.00       9         5        20       11.3       7.8         0.6

M U T A G E N I C I T Y                    CONTRACT NO.: 191482
EXP DATE: 042083    CHEMICAL: HS           ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98           BATCH: D193
DILUTION=  1: 20    PLATED= 100            COLONIES=
MIXTURE= 500        TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00      20        27        19       22.0       4.4     A   1.0
 P1 03     1.00     695       719       743      719.0      24.0     A  32.7
 P2 03     2.00    1379      1508      1517     1468.0      77.2     A  66.7
          17.00      28        32        18       26.0       7.2         1.2
          57.00      35        20        30       28.3       7.6         1.3
         175.00      25        27        21       24.3       3.1         1.1
         582.00      13        22        30       21.7       8.5         1.0
        1750.00      19        20        22       20.3       1.5         0.9

M U T A G E N I C I T Y                    CONTRACT NO.: 191482
EXP DATE: 042083    CHEMICAL: HS           ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98           BATCH: D193
DILUTION=  1: 20    PLATED= 100            COLONIES=
MIXTURE= 500        TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00      18        32        22       24.0       7.2     A   1.0
 P1 04     0.50     447       648       507      534.0     103.2     A  22.3
 P2 04     1.00    1623      1420      1098     1380.3     264.7     A  57.5
          17.00      23        37        25       28.3       7.6         1.2
          57.00      33        29        34       32.0       2.6         1.3
         175.00      18        27        28       24.3       5.5         1.0
         582.00      25        13        20       19.3       6.0         0.8
        1750.00      17        21        12       16.7       4.5         0.7
```

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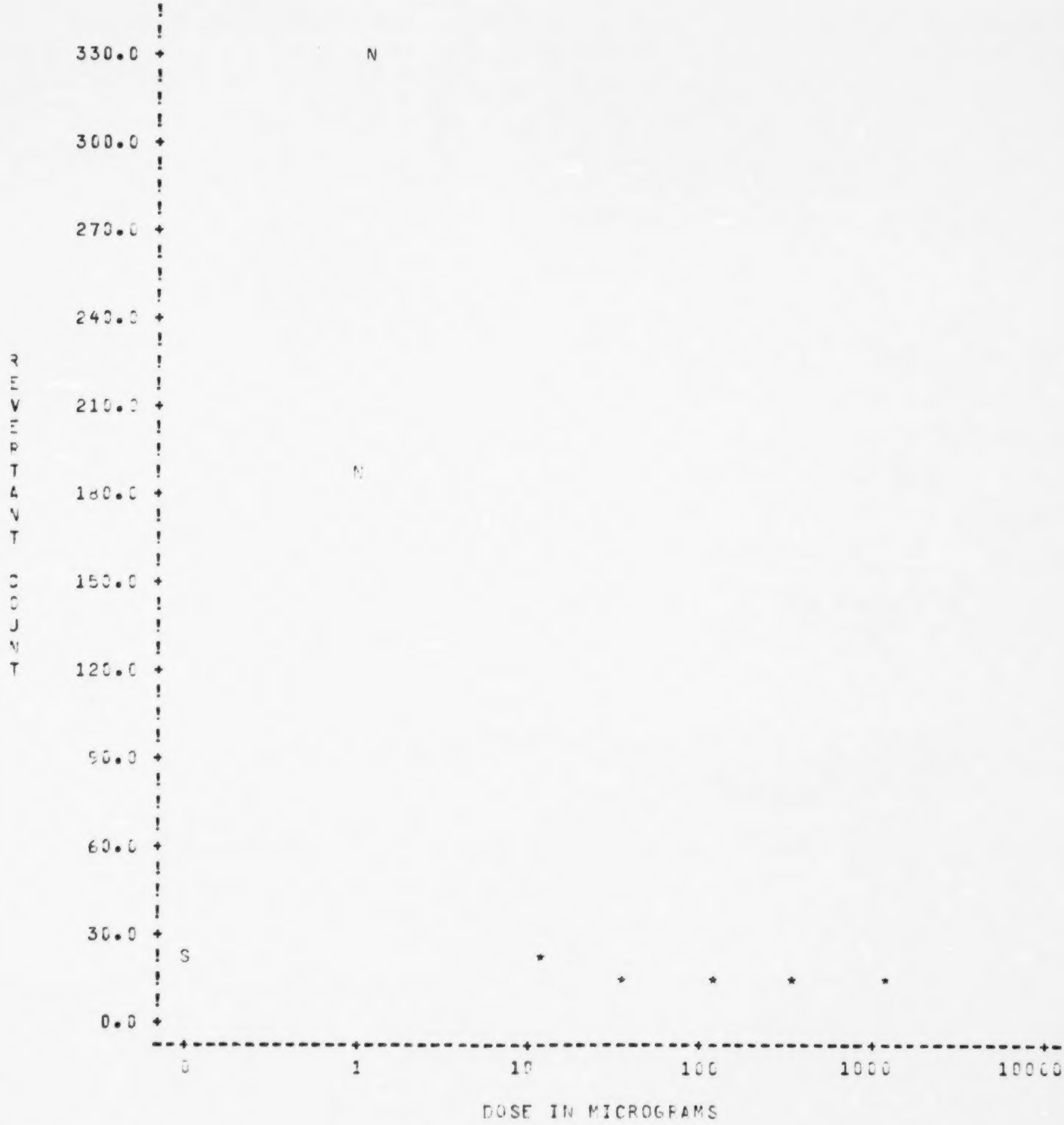
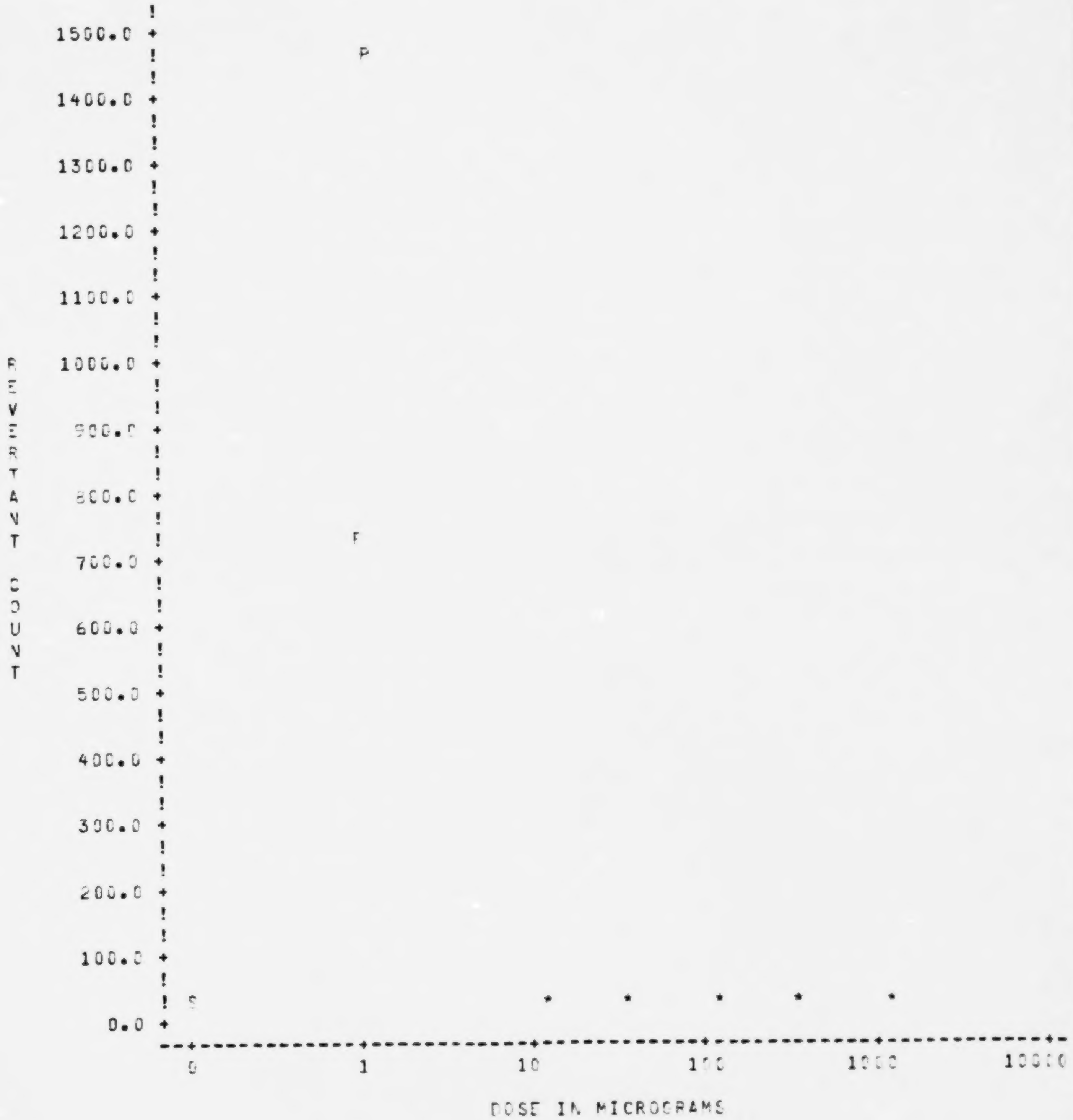
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=HS   STRAIN=98   DATE=042083   ACTIV=     ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



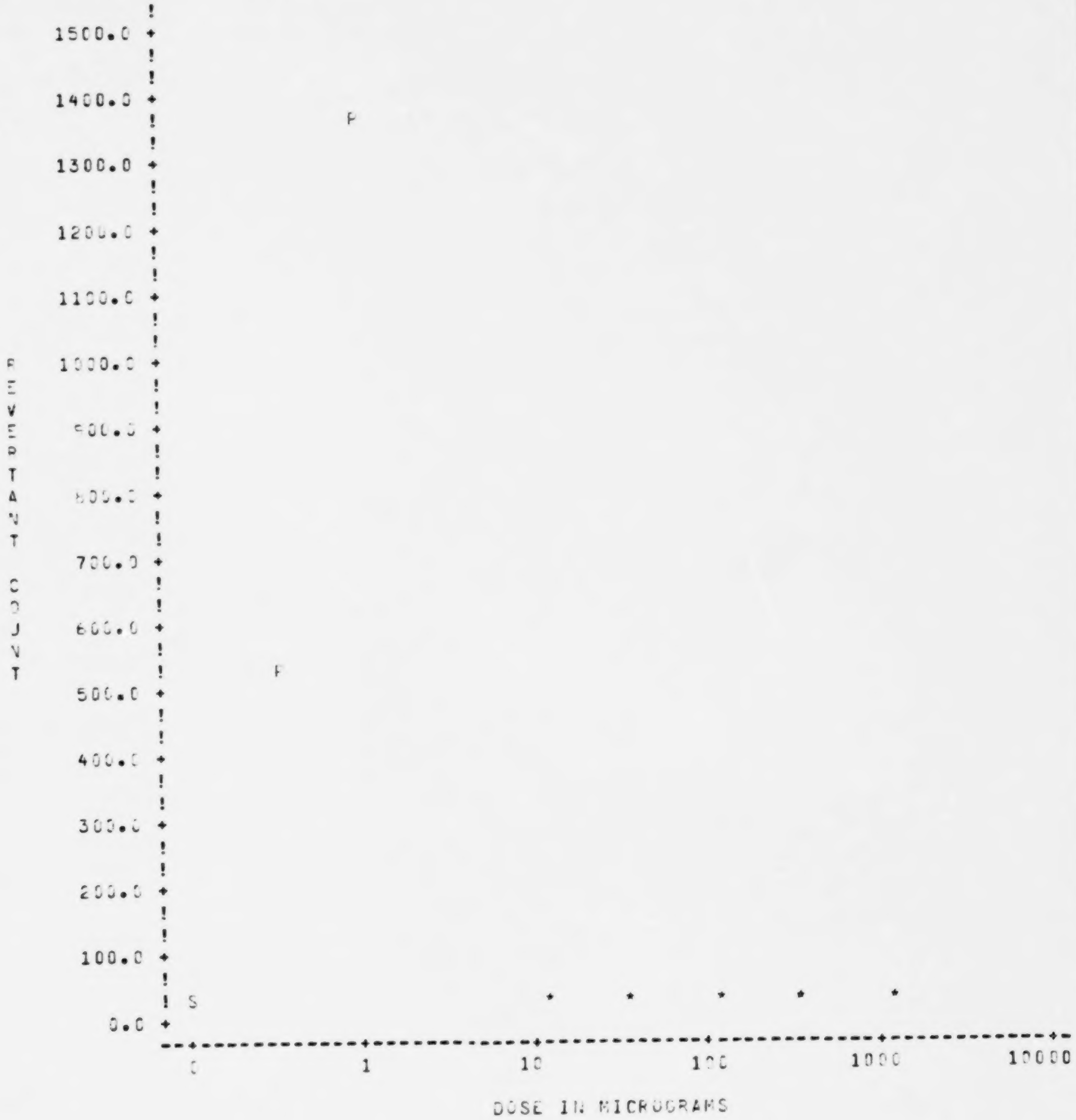
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=151482   CHEM=HS   STRAIN=98   DATE=042083   ACTIV=CSD002   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=HS   STRAIN=98   DATE=042083   ACTIV=HEPA01   ACT%=05

          PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF HS - TA100

```
M U T A G E N I C I T Y              CONTRACT NO.: 191482
EXP DATE: 042083    CHEMICAL: HS     ACTIVATION:
TEST TYPE: 05       STRAIN: TA100    BATCH: D193
DILUTION=   :       PLATED=          COLONIES=
MIXTURE=            TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55      0.00     167       153       169      163.0      8.7    A   1.0
 P1 01      1.00     975      1143      1768     1295.3    417.9    A   7.9
 P2 01      2.00    1611      2139      1746     1831.7    273.7    A  11.2
           17.00     169       175       181      175.0      6.0        1.1
           57.00     155       146       192      164.3     24.4        1.0
          175.00     123       108       775      335.3    380.8        2.1   *
          582.00     151       140       195      162.0     29.1        1.0
         1750.00     187       193       145      175.0     26.2        1.1

M U T A G E N I C I T Y              CONTRACT NO.: 191482
EXP DATE: 042083    CHEMICAL: HS     ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100    BATCH: D193
DILUTION=  1: 20    PLATED= 100      COLONIES=
MIXTURE= 500        TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55      0.00     170       178       164      170.7      7.0    A   1.0
 P1 04      1.00     396       598       505      499.7    101.1    A   2.9
 P2 04      2.00     811       851       746      802.7     53.0    A   4.7
           17.00     145       166       178      163.0     16.7        1.0
           57.00     176       156       167      166.3     10.0        1.0
          175.00     185       186       188      186.3      1.5        1.1
          582.00     198       197       155      183.3     24.5        1.1
        11750.00     164       136       191      163.7     27.5        1.0

M U T A G E N I C I T Y              CONTRACT NO.: 191482
EXP DATE: 042083    CHEMICAL: HS     ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100    BATCH: D193
DILUTION=  1: 20    PLATED= 100      COLONIES=
MIXTURE= 500        TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55      0.00     168       195       222      195.0     27.0    A   1.0
 P1 04      0.50    1122      1232      1234     1196.0     64.1    A   6.1
 P2 04      1.00    2025      2121      1646     1930.7    251.2    A   9.9
           17.00     155       135       164      151.3     14.8        0.8
           57.00     187       169       167      174.3     11.0        0.9
          175.00     155       149       138      147.3      8.6        0.8
          582.00     184       204       123      170.3     42.2        0.9
         1750.00     200       156       108      154.7     46.0        0.9
```

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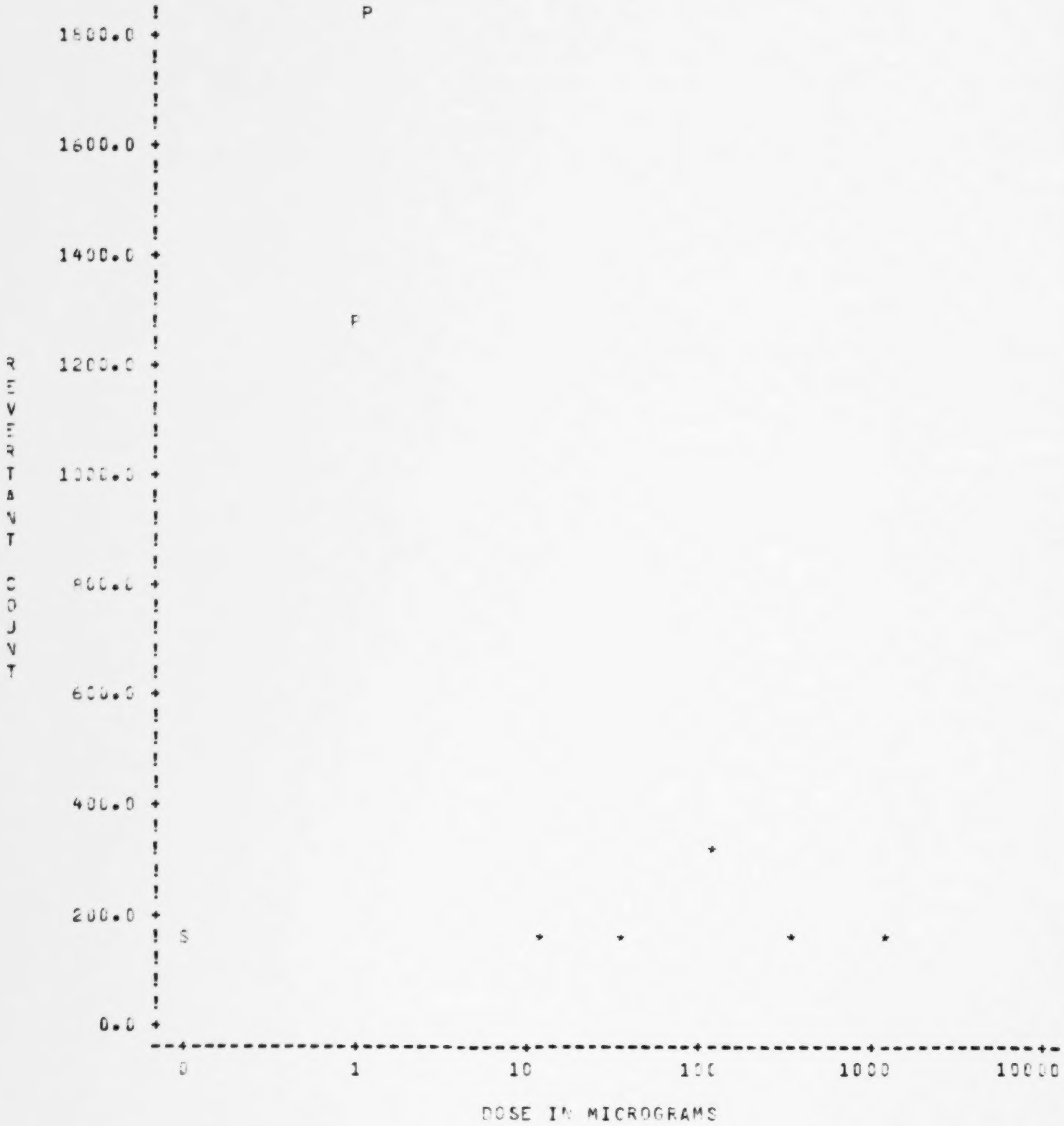
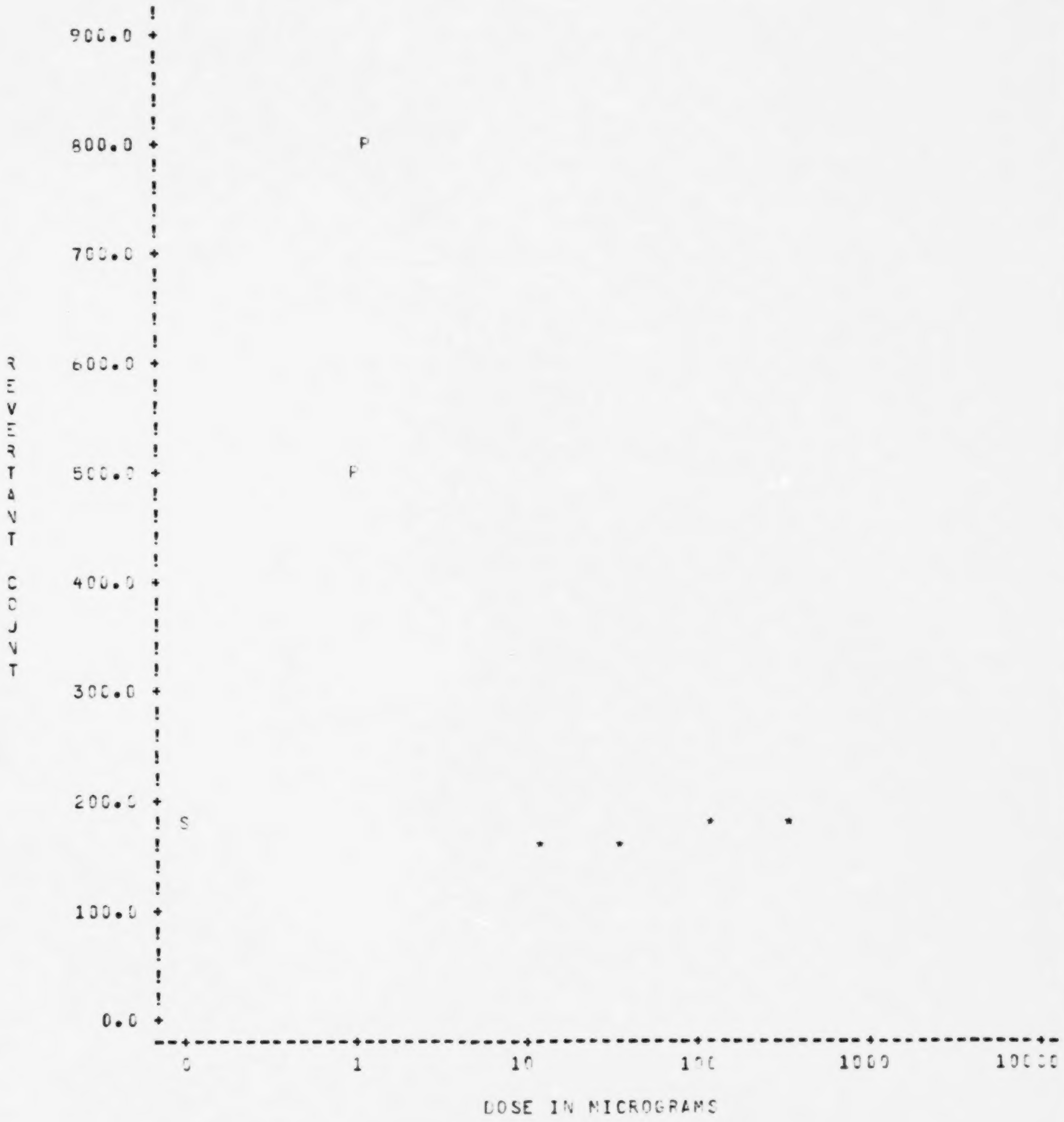
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=HS   STRAIN=100   DATE=042083   ACTIV=     ACT%=05

PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=HS   STRAIN=100   DATE=042083   ACTIV=CSD002   ACTN=05

            PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



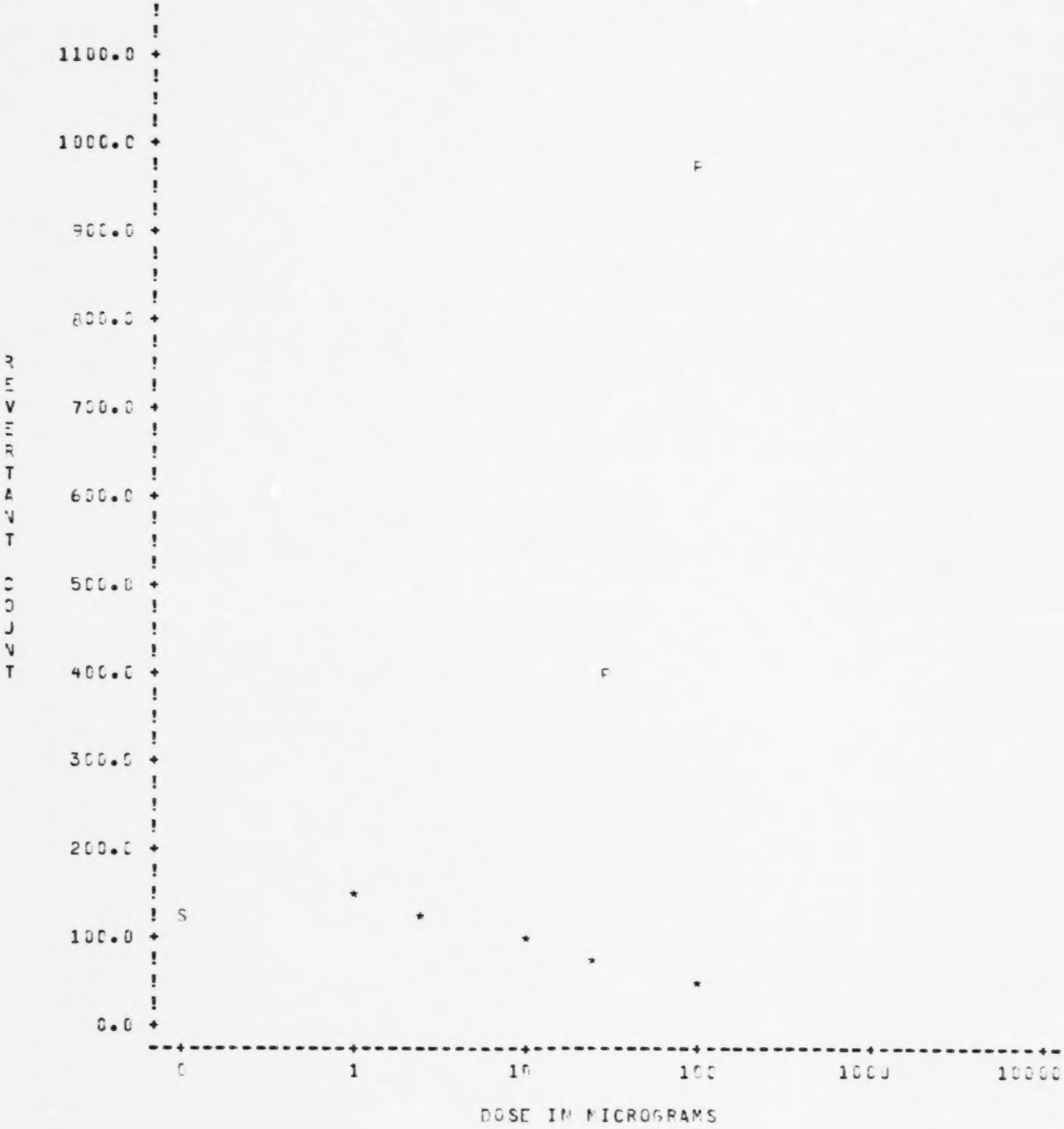
```
NOTE:        1 OBS HAD MISSING VALUES OR WERE OUT OF RANGE
```

```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=HS   STRAIN=100   DATE=042083   ACTIV=HEPA01   ACT%=05

                   PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    2250.0 +
           !
           !
           !
           !
    2000.0 +
           !              P
           !
           !
           !
    1750.0 +
           !
           !
           !
           !
R   1500.0 +
E          !
V          !
E          !
R          !
T   1250.0 +
A          !        P
N          !
T          !
           !
C   1000.0 +
O          !
U          !
N          !
T          !
     750.0 +
           !
           !
           !
           !
     500.0 +
           !
           !
           !
           !
     250.0 +
           ! S
           !                             *     *      *     *      *
           !
           !
       0.0 +
           --+------------+-------------+------------+------------+-------------+-
             0            1             10          100         1000        10000

                                    DOSE IN MICROGRAMS
```

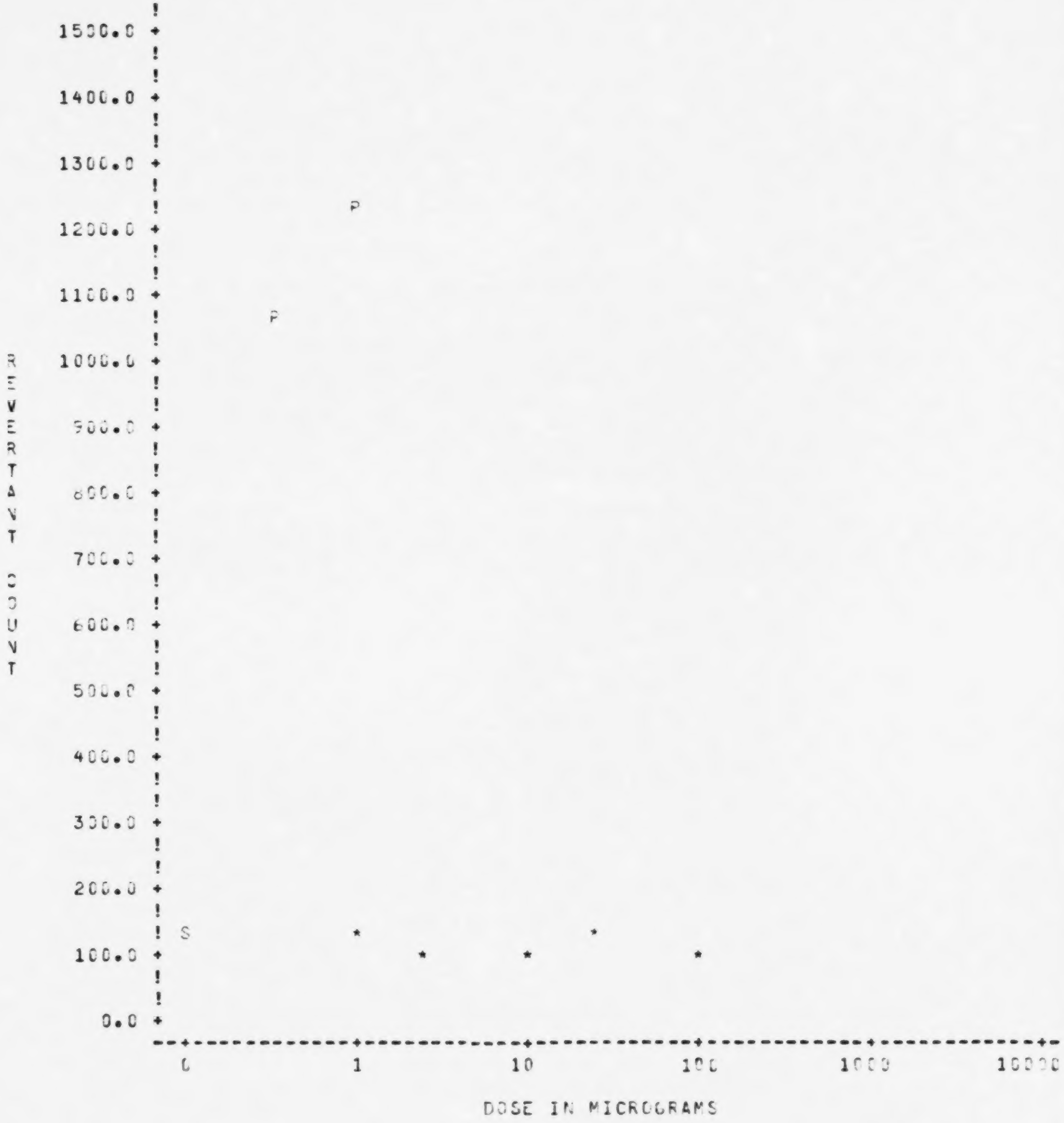
MUTAGENICITY OF BT - TA97

```
M U T A G E N I C I T Y                  CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: BT        ACTIVATION:
TEST TYPE: 05        STRAIN: TA97        BATCH: D203
DILUTION=   :        PLATED=             COLONIES=
MIXTURE=             TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00      82        126       142      116.7      31.1    A   1.0
 P1 02     50.00     385        451       384      406.7      38.4    A   3.5
 P2 02    100.00     714       1083      1095      964.0     216.6    A   8.3
            1.30     121        194       111      142.0      45.3        1.2
            4.20      99        117       124      113.3      12.9        1.0
           13.00     110         77        94       93.7      16.5        0.8
           43.20      59         98        79       78.7      19.5        0.7
          130.00      61         52        41       51.3      10.0        0.4

M U T A G E N I C I T Y                  CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: BT        ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97        BATCH: D203
DILUTION=  1: 20     PLATED= 100         COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00     113        114       115      114.0       1.0    A   1.0
 P1 04      1.00     721        611       717      683.0      62.4    A   6.0
 P2 04      2.00    1182       1109      1279     1190.0      85.3    A  10.4
            1.30      83        129        97      103.0      23.6        0.9
            4.20     117        124       130      123.7       6.5        1.1
           13.00      97        110        77       94.7      16.6        0.8
           43.20      60         49        56       55.0       5.6        0.5
          130.00      58        113        84       85.0      27.5        0.7

M U T A G E N I C I T Y                  CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: BT        ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97        BATCH: D203
DILUTION=  1: 20     PLATED= 100         COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00     115        120       148      127.7      17.8    A   1.0
 P1 04      0.50    1110       1062      1029     1067.0      40.7    A   8.4
 P2 04      1.00    1125       1254      1285     1221.3      84.9    A   9.6
            1.30     112        142       114      122.7      16.8        1.0
            4.20     129         94       125      116.0      19.2        0.9
           13.00     110        108        93      103.7       9.3        0.8
           43.20     118        114       130      120.7       8.3        0.9
          130.00      93         89       117       99.7      15.1        0.8
```

```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
  CON=191482    CHEM=BT    STRAIN=97    DATE=042183    ACTIV=     ACT%=05

               PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



```
           S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
   CON=191482   CHEM=BT   STRAIN=97   DATE=042183   ACTIV=CSD002   ACT%=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

          !
   1500.0 +
          !
          !
   1400.0 +
          !
          !
   1300.0 +
          !
          !
   1200.0 +              P
          !
          !
   1100.0 +
          !
          !
R  1000.0 +
E         !
V         !
E   900.0 +
R         !
T         !
A   800.0 +
N         !
T         !
    700.0 +
C         !             P
O         !
U   600.0 +
N         !
T         !
    500.0 +
          !
          !
    400.0 +
          !
          !
    300.0 +
          !
          !
    200.0 +
          !
          !                  *
    100.0 + S           *           *           *
          !                              *
          !
      0.0 +
          --+-----------+-----------+-----------+-----------+-----------+-
            0           1          10          100        1000       10000

                                 DOSE IN MICROGRAMS
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191462   CHEM=BT   STRAIN=97   DATE=042183   ACTIV=HEPA01   ACT%=05

           PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

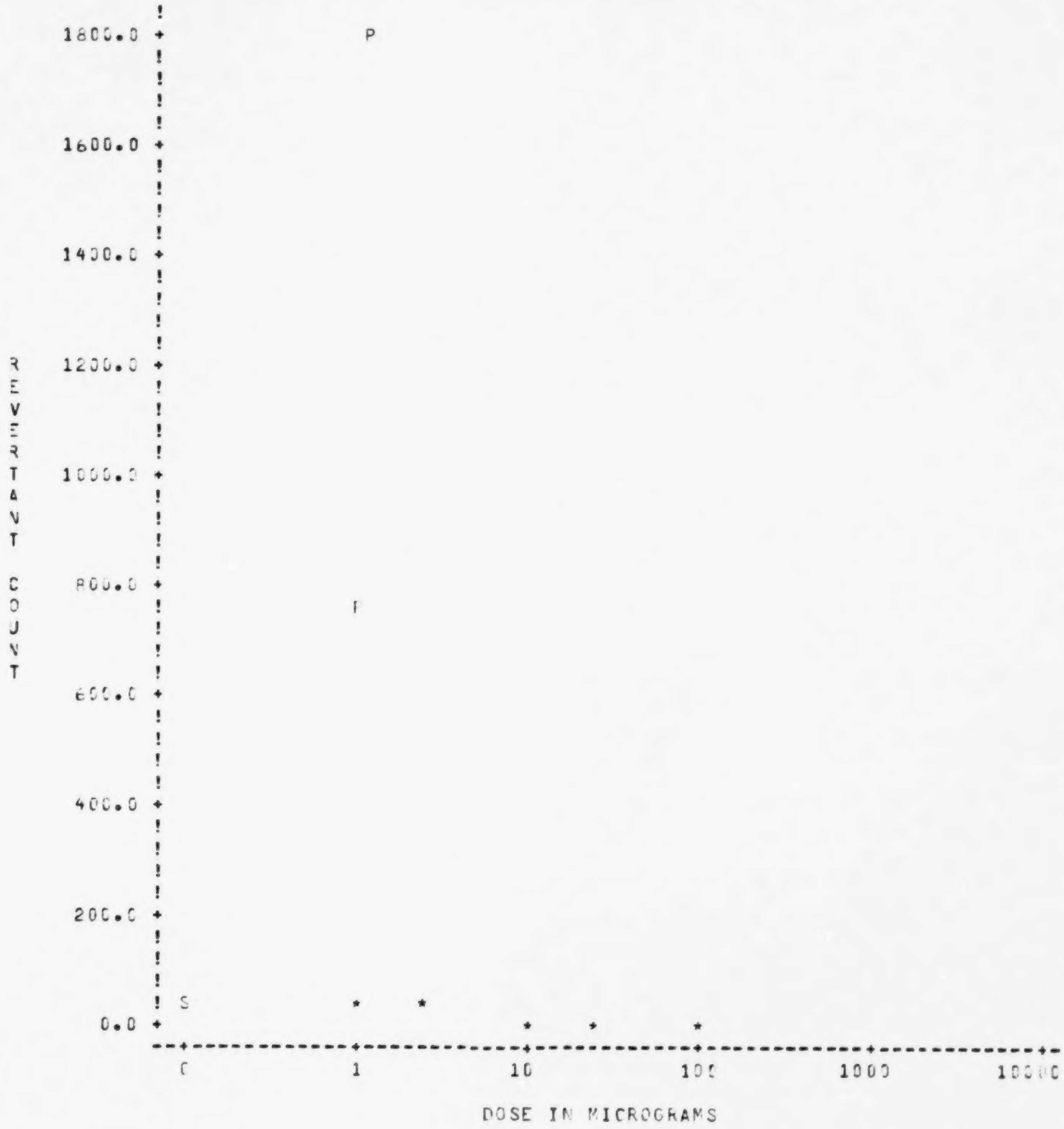


MUTAGENICITY OF BT - TA98

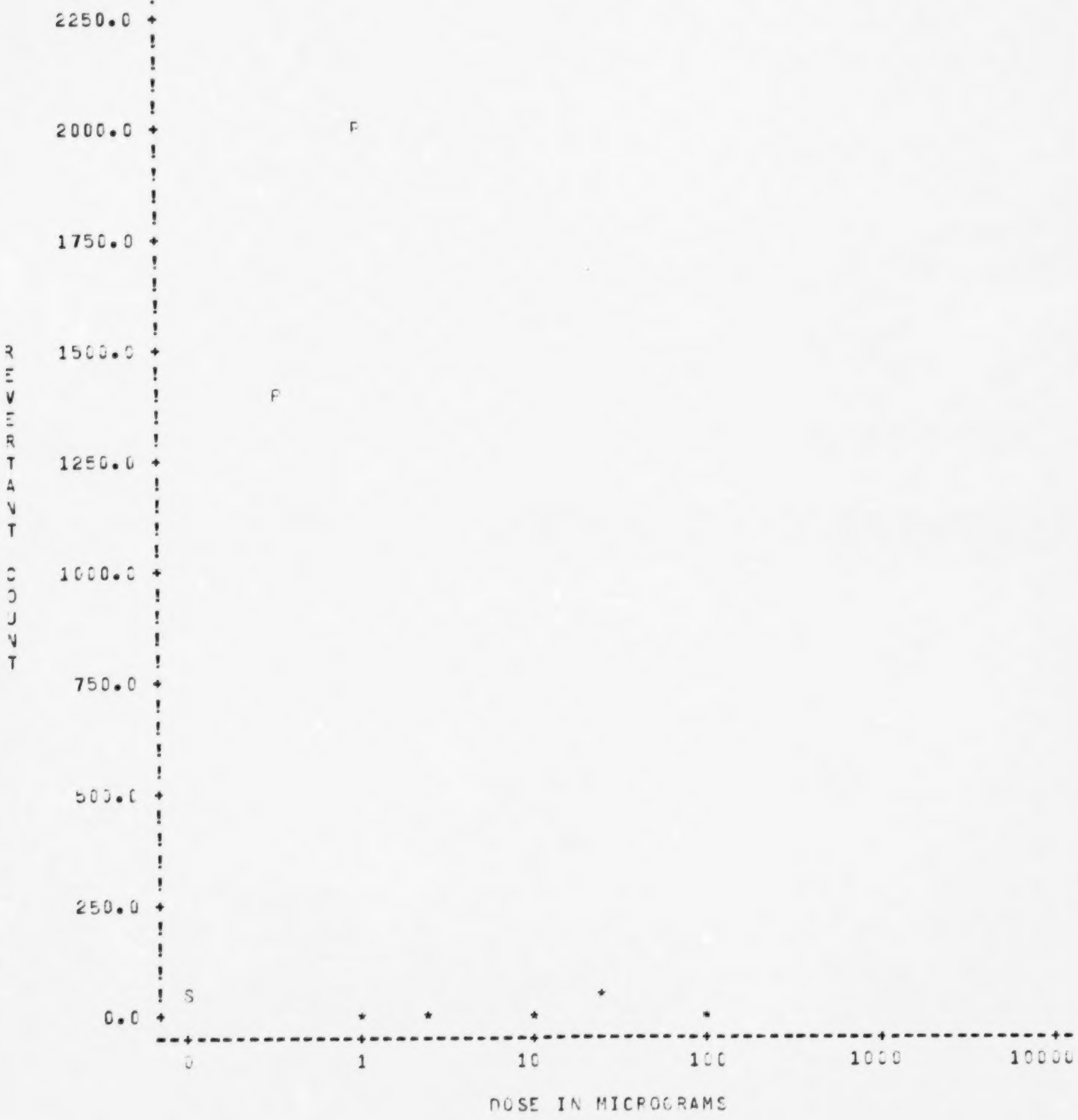
```
M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042183    CHEMICAL: BT                ACTIVATION:
TEST TYPE: 05       STRAIN: TA98                BATCH: D203
DILUTION=   :       PLATED=                     COLONIES=
MIXTURE=            TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00     20        18        17        18.3       1.5     A    1.0
 P1 03     1.00    218       181       168       189.0      25.9     A   10.3
 P2 03     2.00    347       288       301       312.0      31.0     A   17.0
           1.30     16        19        18        17.7       1.5          1.0
           4.20      8        14        14        12.0       3.5          0.7
          13.00     11        14        15        13.3       2.1          0.7
          43.20     14        22        12        16.0       5.3          0.9
         130.00     15        13        13        13.7       1.2          0.7

M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042183    CHEMICAL: BT                ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98                BATCH: D203
DILUTION=  1: 20    PLATED= 100                 COLONIES=
MIXTURE= 500        TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00     44        37        26        35.7       9.1     A    1.0
 P1 04     1.00    719       778       726       741.0      32.2     A   20.8
 P2 04     2.00   1789      1908      1701      1799.3     103.9     A   50.4
           1.30     19        22        22        21.0       1.7          0.6
           4.20     18        27        23        22.7       4.5          0.6
          13.00     20            4     17        18.5       2.1          0.5
          43.20     12        21        16        16.3       4.5          0.5
         130.00     16        16        22        18.0       3.5          0.5

M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042183    CHEMICAL: BT                ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98                BATCH: D203
DILUTION=  1: 20    PLATED= 100                 COLONIES=
MIXTURE= 500        TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00     23        36        24        27.7       7.2     A    1.0
 P1 04     0.50   1206      1410      1527      1381.0     162.5     A   49.9
 P2 04     1.00   1819      2158      2077      2018.0     177.0     A   72.9
           1.30     19        23        25        22.3       3.1          0.8
           4.20     19        27        23        23.0       4.0          0.8
          13.00     17        20        25        20.7       4.0          0.7
          43.20     24        22        34        26.7       6.4          1.0
         130.00     18        15        18        17.0       1.7          0.6
```

```
                 S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
          CON=191482   CHEM=BT   STRAIN=98   DATE=042183   ACTIV=     ACT%=05

                            PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND

                 !
                 !
           330.0 +
                 !
                 !                       P
                 !
           300.0 +
                 !
                 !
                 !
           270.0 +
                 !
                 !
                 !
           240.0 +
                 !
R                !
E                !
V          210.0 +
E                !
R                !
T                !                      P
A          180.0 +
N                !
T                !
                 !
C          150.0 +
O                !
U                !
N                !
T          120.0 +
                 !
                 !
                 !
            90.0 +
                 !
                 !
                 !
            60.0 +
                 !
                 !
                 !
            30.0 +
                 !
                 !  S                   *      *            *      *            *
                 !
             0.0 +
                 ---+-------------------+-------------------+-------------------+-------------------+-------------------+-
                    0                   1                  10                 100                1000               10000

                                                       DOSE IN MICROGRAMS
```

```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=BT   STRAIN=98   DATE=042183   ACTIV=CSD002   ACTX=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=BT   STRAIN=98   DATE=042183   ACTIV=HEPA01   ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF BT - TA100

```
M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042183      CHEMICAL: BT            ACTIVATION:
TEST TYPE: 05         STRAIN: TA100           BATCH: D203
DILUTION=   :         PLATED=                 COLONIES=
MIXTURE=              TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00    164        132        138     144.7      17.0    A    1.0
 P1 01      1.00    334        446        477     419.0      75.2    A    2.9
 P2 01      2.00    619        713        626     652.7      52.4    A    4.5
            1.30    142        135        121     132.7      10.7         0.9
            4.20    121        126        129     125.3       4.0         0.9
           13.00    131        112        108     117.0      12.3         0.8
           43.20    115        141        141     132.3      15.0         0.9
          130.00     81         89         94      88.0       6.6         0.6

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042183      CHEMICAL: BT            ACTIVATION: CSD002
TEST TYPE: 05         STRAIN: TA100           BATCH: D203
DILUTION=  1: 20      PLATED= 100             COLONIES=
MIXTURE= 500          TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00    138        163        161     154.0      13.9    A    1.0
 P1 04      1.00    571        775       1382     909.3     421.9    A    5.9
 P2 04      2.00   1712       1239       1487    1479.3     236.6    A    9.6
            1.30    134        165        182     160.3      24.3         1.0
            4.20    118        107         98     107.7      10.0         0.7
           13.00    120        117         91     109.3      15.9         0.7
           43.20    127        142        111     126.7      15.5         0.8
          130.00      0          0          0       0.0       0.0         0.0

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042183      CHEMICAL: BT            ACTIVATION: HEPA01
TEST TYPE: 05         STRAIN: TA100           BATCH: D203
DILUTION=  1: 20      PLATED= 100             COLONIES=
MIXTURE= 500          TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00    149        170        160     159.7      10.5    A    1.0
 P1 04      0.50   1527       1538       1149    1404.7     221.5    A    8.8
 P2 04      1.00   2129       2043       2186    2119.3      72.0    A   13.3
            1.30     89        112         99     100.0      11.5         0.6
            4.20    131        121        117     123.0       7.2         0.8
           13.00    113        133        116     120.7      10.8         0.8
           43.20    125        150        135     136.7      12.6         0.9
          130.00    114        116        107     112.3       4.7         0.7
```

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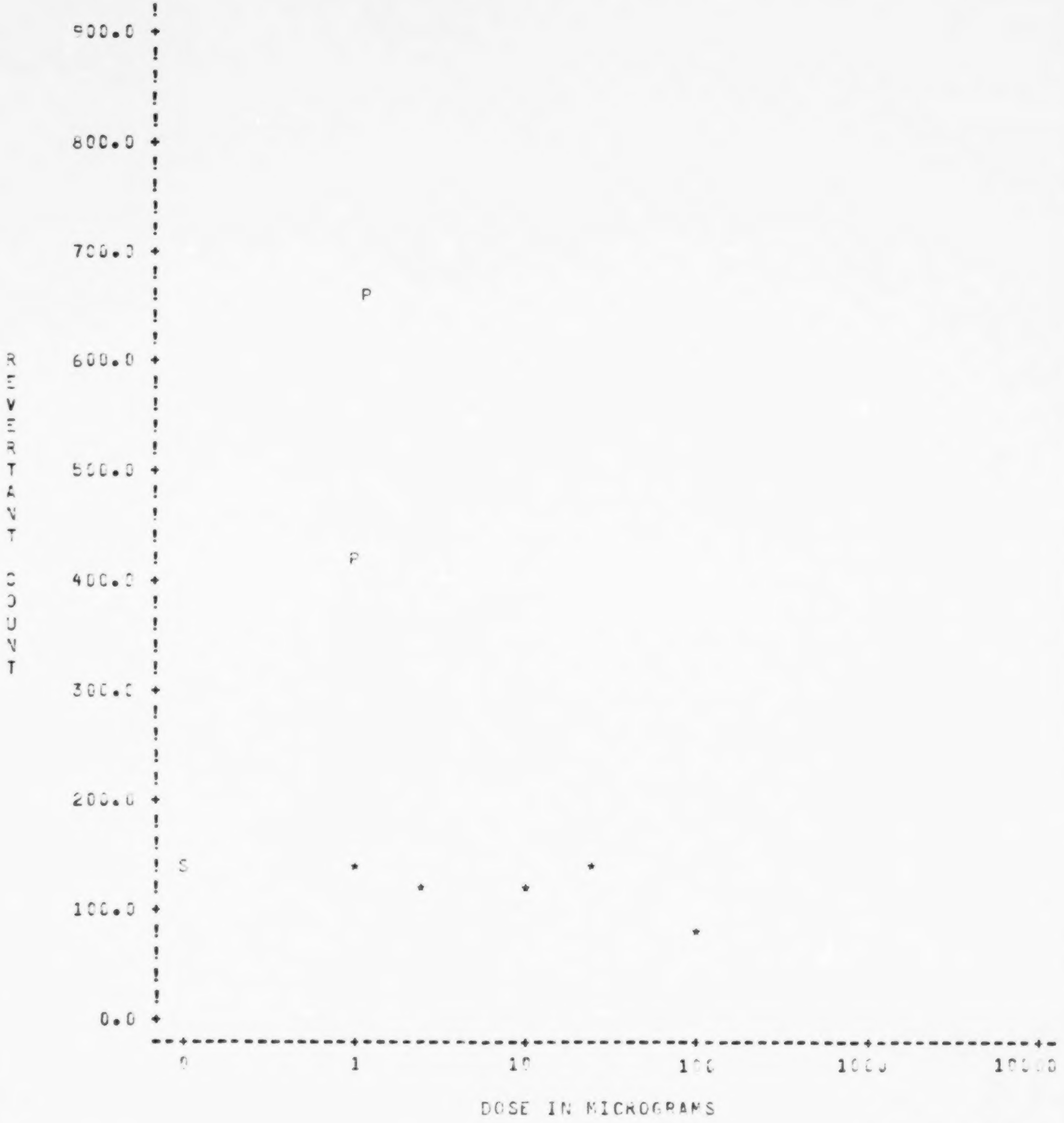
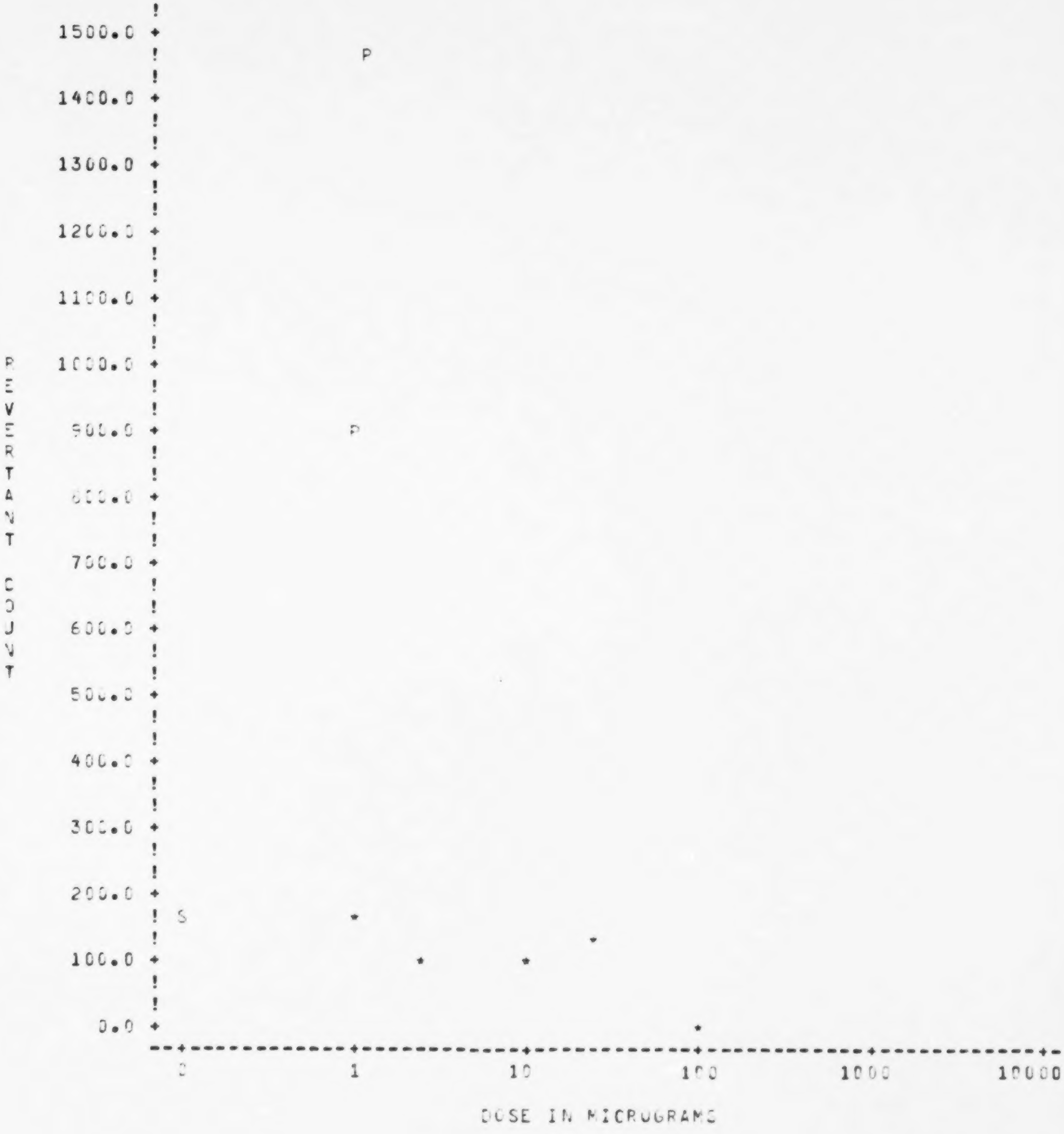
```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=BT   STRAIN=100   DATE=042193   ACTIV=      ACT%=05

PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



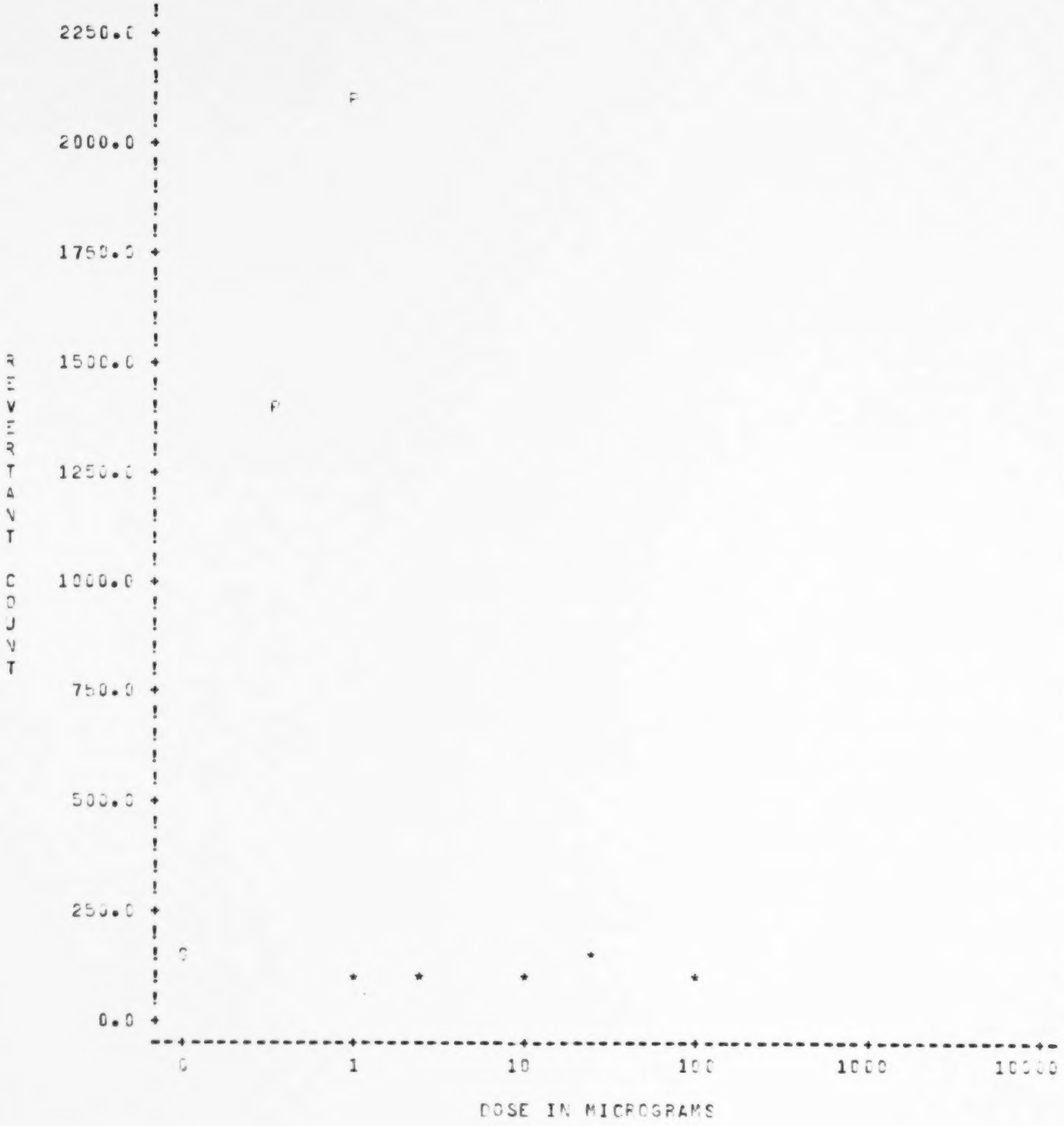
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=BT   STRAIN=100   DATE=042183   ACTIV=CSD002   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=BT   STRAIN=100   DATE=042183   ACTIV=HEPA01   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF PP - TA97

```
M U T A G E N I C I T Y                  CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP        ACTIVATION:
TEST TYPE: 05        STRAIN: TA97        BATCH: D203
DILUTION=   :        PLATED=             COLONIES=
MIXTURE=             TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55     0.00      82        126       142      116.7     31.1    A   1.0
 P1 02    50.00     325        451       384      406.7     38.4    A   3.5
 P2 02   100.00     714       1083      1095      964.0    216.6    A   8.3
           6.30      94        153       188      145.0     47.5        1.2
          20.60     153        145       166      154.7     10.6        1.3
          62.60      94        122       134      116.7     20.5        1.0
         208.00     131        123       132      128.7      4.9        1.1
         626.00      99        106       129      111.3     15.7        1.0

M U T A G E N I C I T Y                  CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP        ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97        BATCH: D203
DILUTION=  1: 20     PLATED= 100         COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55     0.00     113        114       115      114.0      1.0    A   1.0
 P1 04     1.00     721        611       717      683.0     62.4    A   6.0
 P2 04     2.00    1182       1109      1279     1190.0     85.3    A  10.4
           6.30     109        150       146      135.0     22.6        1.2
          20.60     154        156       126      145.3     16.8        1.3
          62.60     130        117       161      136.0     22.6        1.2
         208.00     117        172       139      142.7     27.7        1.3
         626.00     121        126       148      131.7     14.4        1.2

M U T A G E N I C I T Y                  CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP        ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97        BATCH: D203
DILUTION=  1: 20     PLATED= 100         COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55     0.00     115        120       148      127.7     17.8    A   1.0
 P1 04     0.50    1110       1062      1029     1067.0     40.7    A   9.4
 P2 04     1.00    1125       1254      1285     1221.3     84.9    A   9.6
           6.30     155        176       159      163.3     11.2        1.3
          20.60      91        133       155      126.3     32.5        1.0
          62.60     177        167       168      170.7      5.5        1.3
         208.00     126        121       155      134.0     18.4        1.0
         626.00     137        191       162      163.3     27.0        1.3
```

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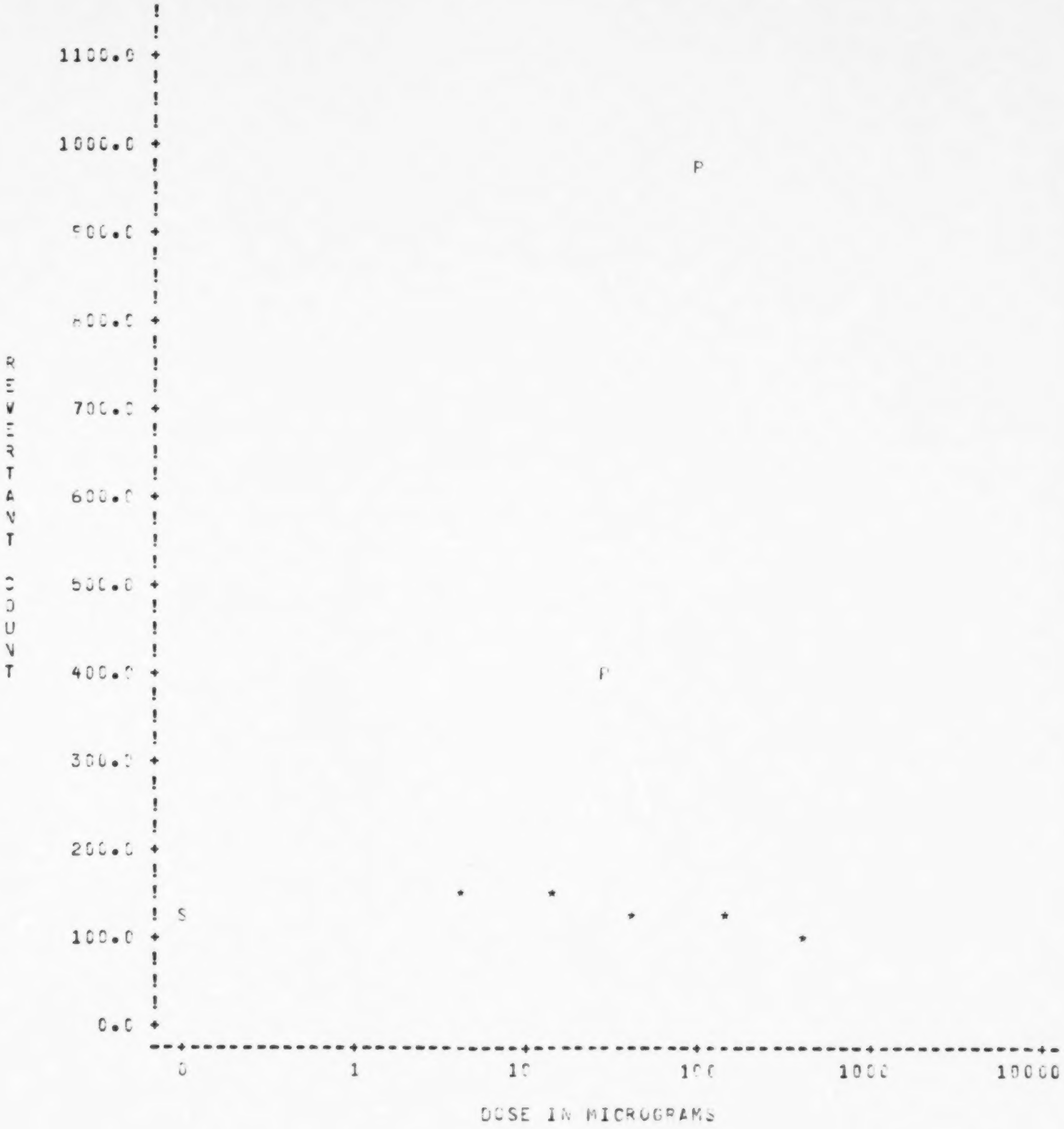
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
 CON=191482   CHEM=PP   STRAIN=97   DATE=042183   ACTIV=     ACT%=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
            S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=PP   STRAIN=97   DATE=042183   ACTIV=CSD002   ACT%=05

                   PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1500.0 +
           !
           !
    1400.0 +
           !
           !
    1300.0 +
           !
           !
    1200.0 +               P
           !
           !
    1100.0 +
           !
           !
R   1000.0 +
E          !
V          !
E    900.0 +
R          !
T          !
A    800.0 +
N          !
T          !
     700.0 +
C          !              P
O          !
U    600.0 +
N          !
T          !
     500.0 +
           !
           !
     400.0 +
           !
           !
     300.0 +
           !
           !
     200.0 +
           !
           !                      *      *     *      *     *
     100.0 + S
           !
           !
       0.0 +
           --+------------+------------+------------+------------+------------+-
             0            1           10           100         1000       10000

                                   DOSE IN MICROGRAMS
            S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=PP   STRAIN=97   DATE=042183   ACTIV=HEPA01   ACTX=05

                   PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1500.0 +
           !
           !
    1400.0 +
           !
           !
    1300.0 +
           !
           !              P
    1200.0 +
           !
           !
    1100.0 +
           !        P
           !
R   1000.0 +
E          !
V          !
E    900.0 +
R          !
T          !
A    800.0 +
N          !
T          !
     700.0 +
C          !
O          !
U    600.0 +
N          !
T          !
     500.0 +
           !
           !
     400.0 +
           !
           !
     300.0 +
           !
           !
     200.0 +
           !                      *            *            *
           ! S                           *            *
     100.0 +
           !
           !
       0.0 +
           --+------------+------------+------------+------------+------------+-
             0            1           10           100         1000        10000

                                    DOSE IN MICROGRAMS
```

MUTAGENICITY OF PP - TA98

```
M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP            ACTIVATION:
TEST TYPE: 05        STRAIN: TA98            BATCH: D203
DILUTION=   :        PLATED=                 COLONIES=
MIXTURE=             TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00      20        19        17       18.3       1.5     A   1.0
 P1 03      1.00     218       181       168      189.0      25.9     A  10.3
 P2 03      2.00     347       288       301      312.0      31.0     A  17.0
            6.30      19        21        18       19.3       1.5         1.1
           20.60      21        11        13       15.0       5.3         0.8
           62.60      16        13        16       15.0       1.7         0.8
          208.00      14        15        10       13.0       2.6         0.7
          626.00      12        21        16       16.3       4.5         0.9

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP            ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA98            BATCH: D203
DILUTION=  1: 20     PLATED= 100             COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00      44        37        26       35.7       9.1     A   1.0
 P1 04      1.00     719       778       726      741.0      32.2     A  20.8
 P2 04      2.00    1789      1908      1701     1799.3     103.9     A  50.4
            6.30      32        26        68       42.0      22.7         1.2
           20.60      22        20        17       19.7       2.5         0.6
           62.60      17        29        23       23.0       6.0         0.6
          208.00      26        24        13       21.0       7.0         0.6
          626.00      21        13        22       18.7       4.9         0.5

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP            ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA98            BATCH: D203
DILUTION=  1: 20     PLATED= 100             COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE     PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C  MR    MEC
POSITIVE  LEVEL    COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55      0.00      23        36        24       26.0      10.0     A   1.0
 P1 04      0.50    1206      1410      1527     1381.0     162.5     A   5.3
 P2 04      1.00    1819      2158      2077     2018.0     177.0     A   7.7
            6.30      27        23        23       24.3       2.3         0.9
           20.60      27        16        16       19.7       6.4         0.8
           62.60      23        14        28       21.7       7.1         0.9
          208.00      23        35        30       29.3       6.0         1.1
          626.00      27        22        26       25.0       2.6         0.9
```

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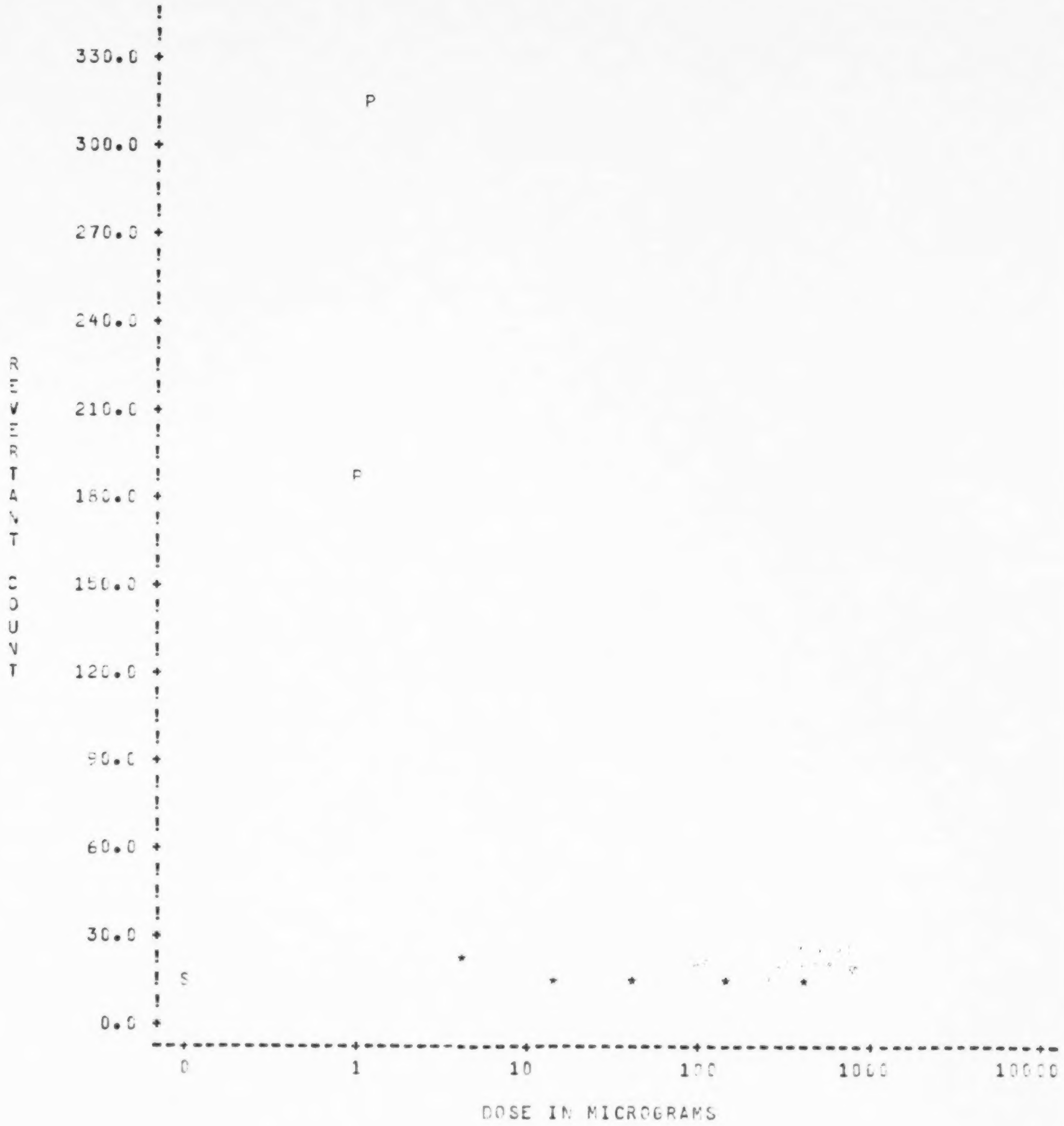
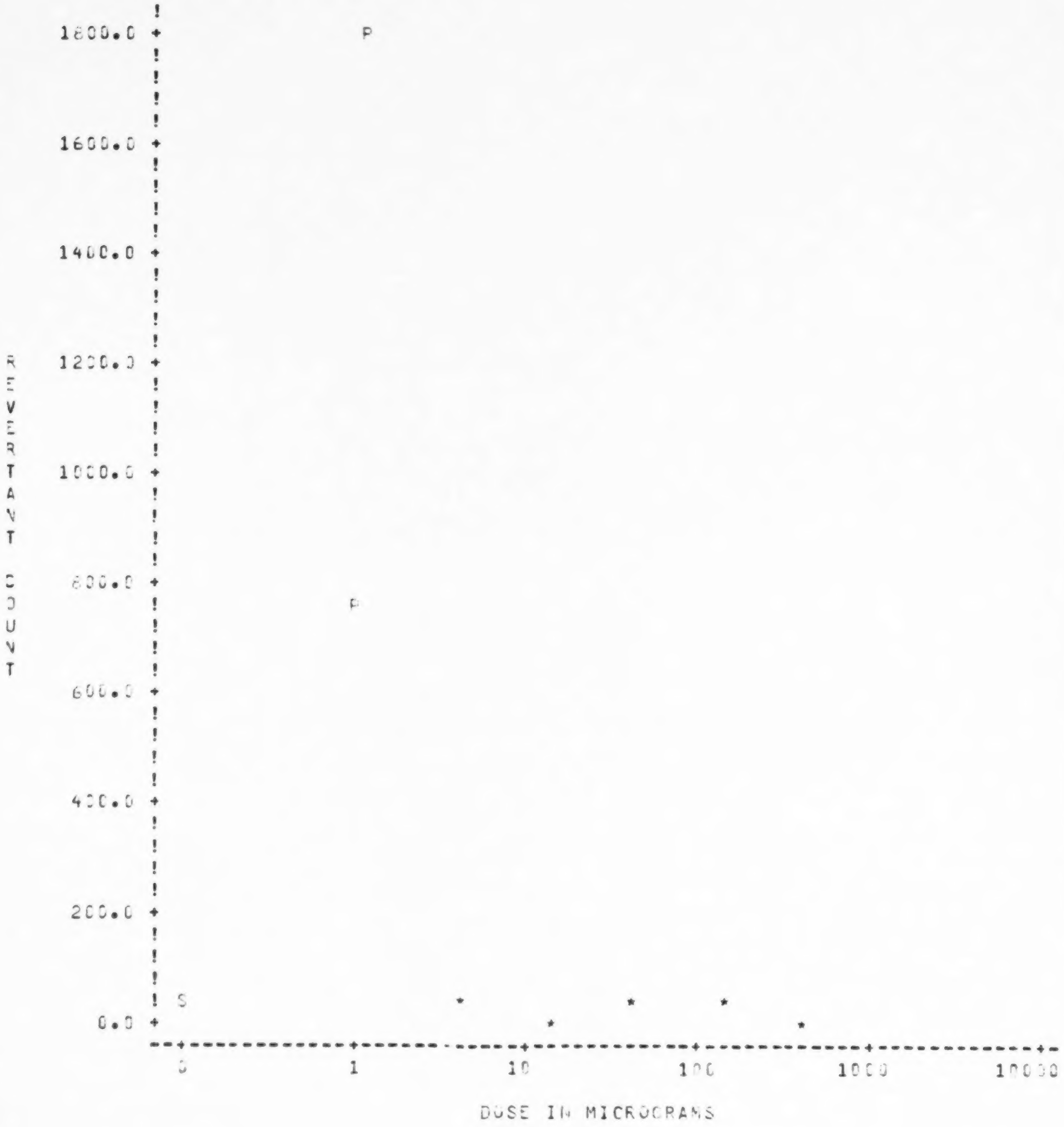
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=PP   STRAIN=98   DATE=042183   ACTIV=     ACT%=05

             PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



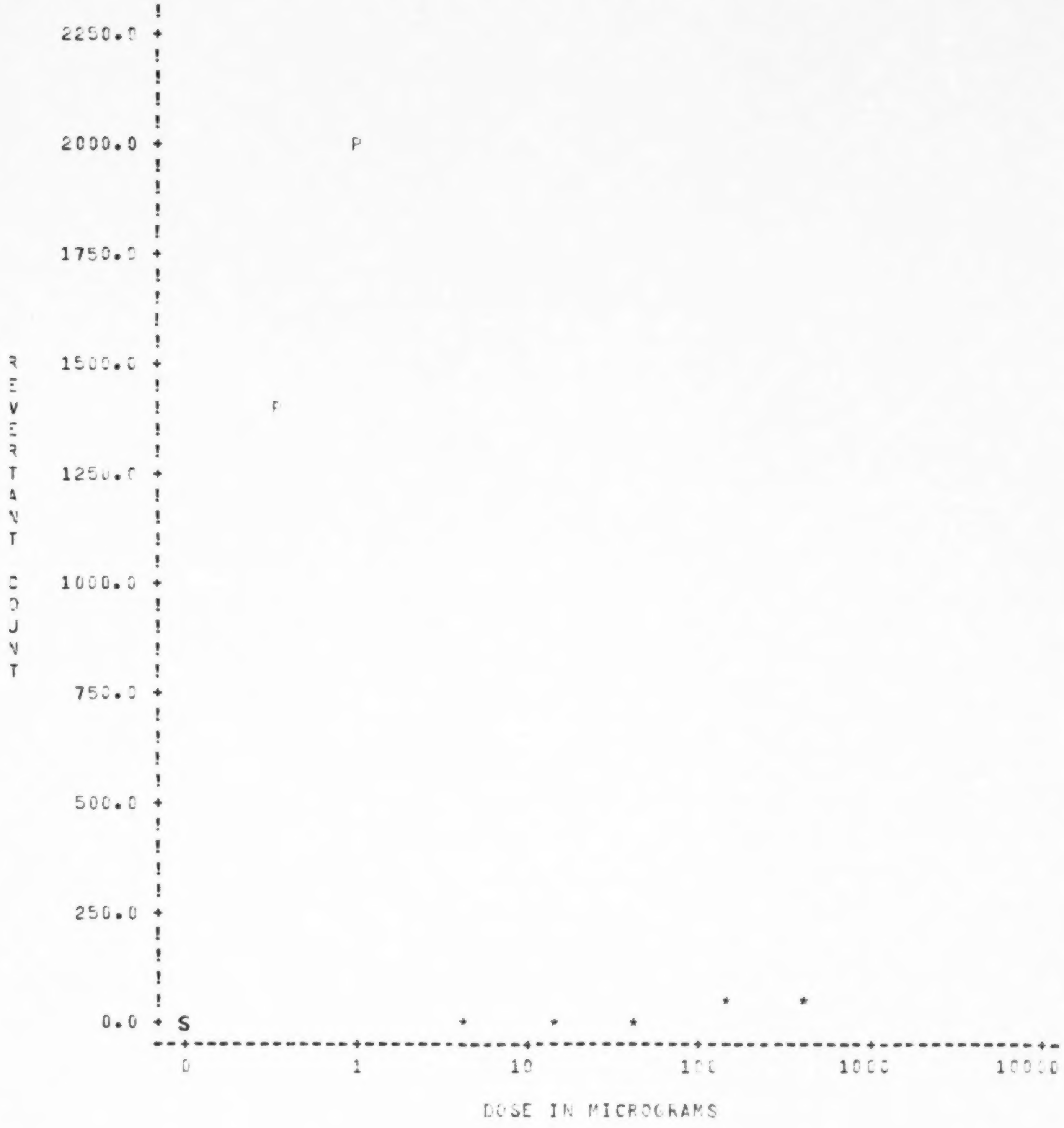
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=PP   STRAIN=98   DATE=042183   ACTIV=CSD002   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=PP   STRAIN=98   DATE=042183   ACTIV=HEPA01   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF PP - TA100

```
M U T A G E N I C I T Y                        CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP              ACTIVATION:
TEST TYPE: 05        STRAIN: TA100             BATCH: D203
DILUTION=    :       PLATED=                   COLONIES=
MIXTURE=             TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55     0.00    164       132       138      144.7     17.0    A   1.0
 P1 01     1.00    334       446       477      419.0     75.2    A   2.9
 P2 01     2.00    619       713       626      652.7     52.4    A   4.5
           6.30    120       129       132      127.0      6.2        0.9
          20.60    141       130       136      135.7      5.5        0.9
          62.60     93       136       124      117.7     22.2        0.8
         208.00     96        96        78       90.0     10.4        0.6
         626.00    123        99       115      112.3     12.2        0.8

M U T A G E N I C I T Y                        CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP              ACTIVATION: CSD002
TEST TYPE:           STRAIN: TA100             BATCH: D203
DILUTION=  1: 20     PLATED= 100               COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55     0.00    138       163       161      154.0     13.9    A   1.0
 P1 04     1.00    571       775      1382      909.3    421.9    A   5.9
 P2 40     2.00   1712      1239      1487     1479.3    236.6    A   9.6
           6.30    110       118        80      102.7     20.0        0.7
          20.60    136       110        74      106.7     31.1        0.7
          62.60    126       112        73      103.7     27.5        0.7
         208.00    161       141       173      158.3     16.2        1.0
         626.00    141       154       168      154.3     13.5        1.0

M U T A G E N I C I T Y                        CONTRACT NO.: 191482
EXP DATE: 042183     CHEMICAL: PP              ACTIVATION: HEPA01
TEST TYPE:           STRAIN: TA100             BATCH: D203
DILUTION=  1: 20     PLATED= 100               COLONIES=
MIXTURE= 500         TECHNICIAN= DMS

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  G/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT    COUNT

 S1 55     0.00    149       170       160      159.7     10.5    A   1.0
 P1 04     0.50   1527      1538      1149     1404.7    221.5    A   8.8
 P2 04     1.00   2129      2043      2186     2119.3     72.0    A  13.3
           6.30    144       136       148      142.7      6.1        0.9
          20.60    145       111        87      114.3     29.1        0.7
          62.60    120       157       121      132.7     21.1        0.8
         208.00    142       119        90      117.0     26.1        0.7
         626.00    123       119        88      110.0     19.2        0.7
```

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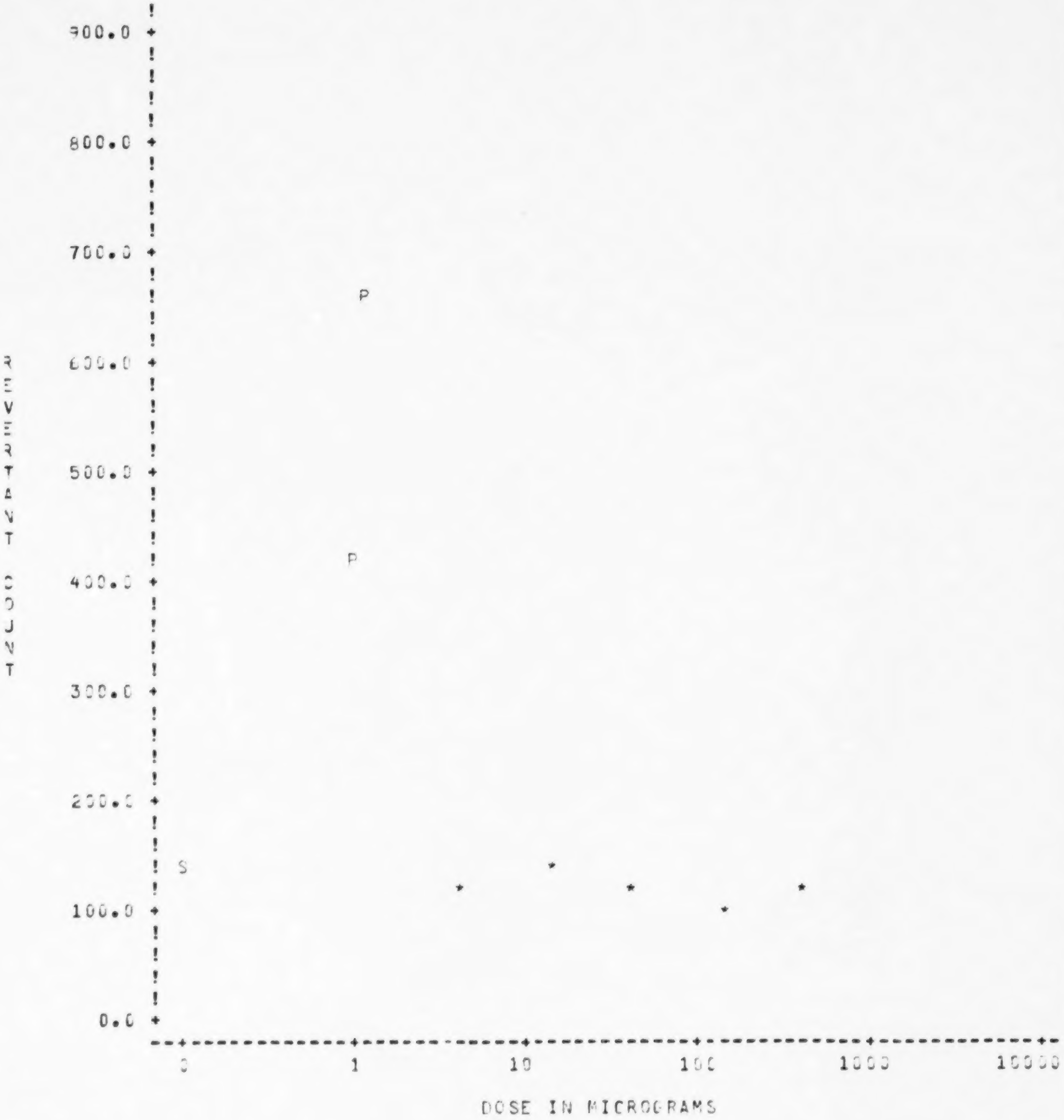
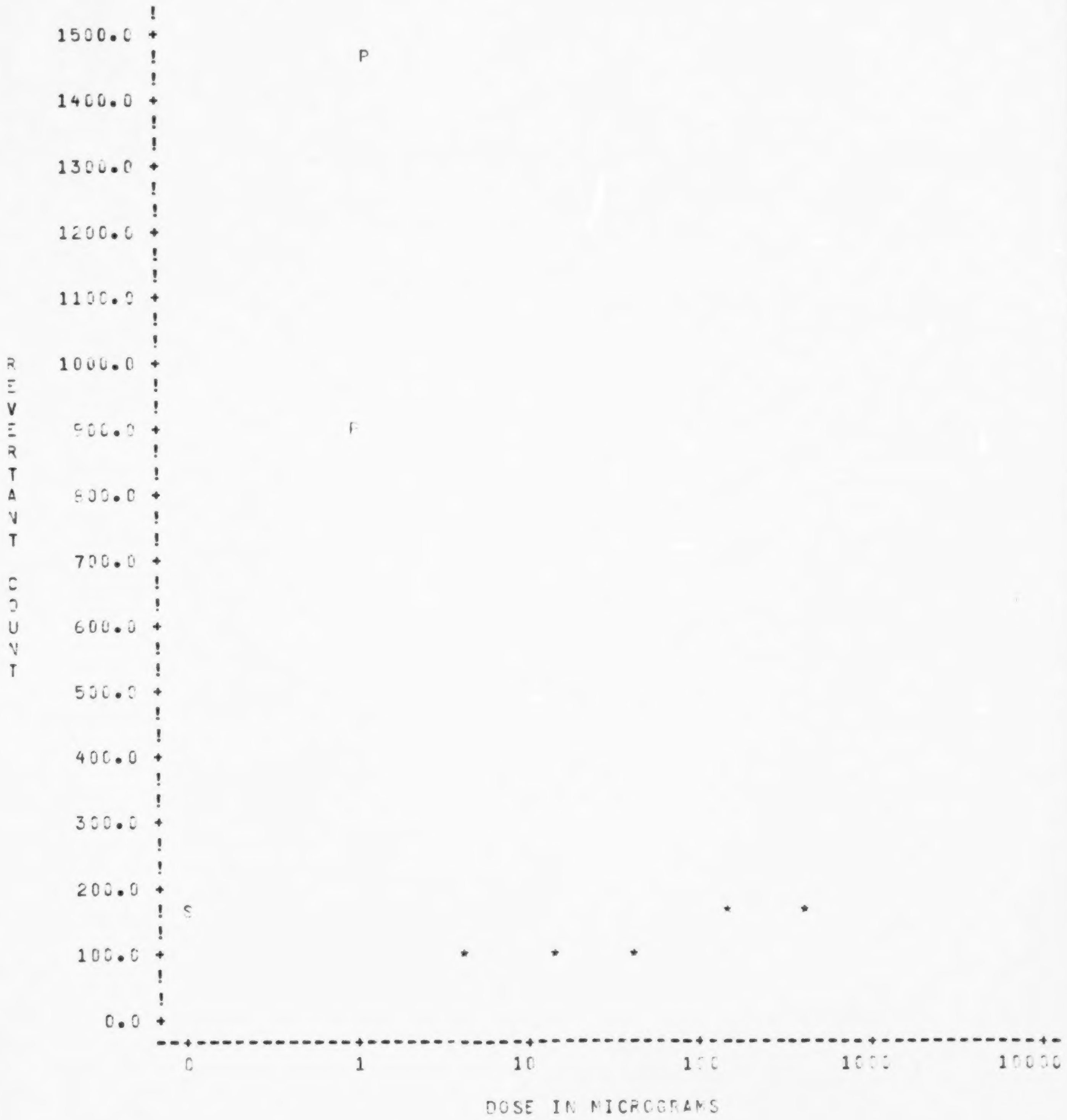
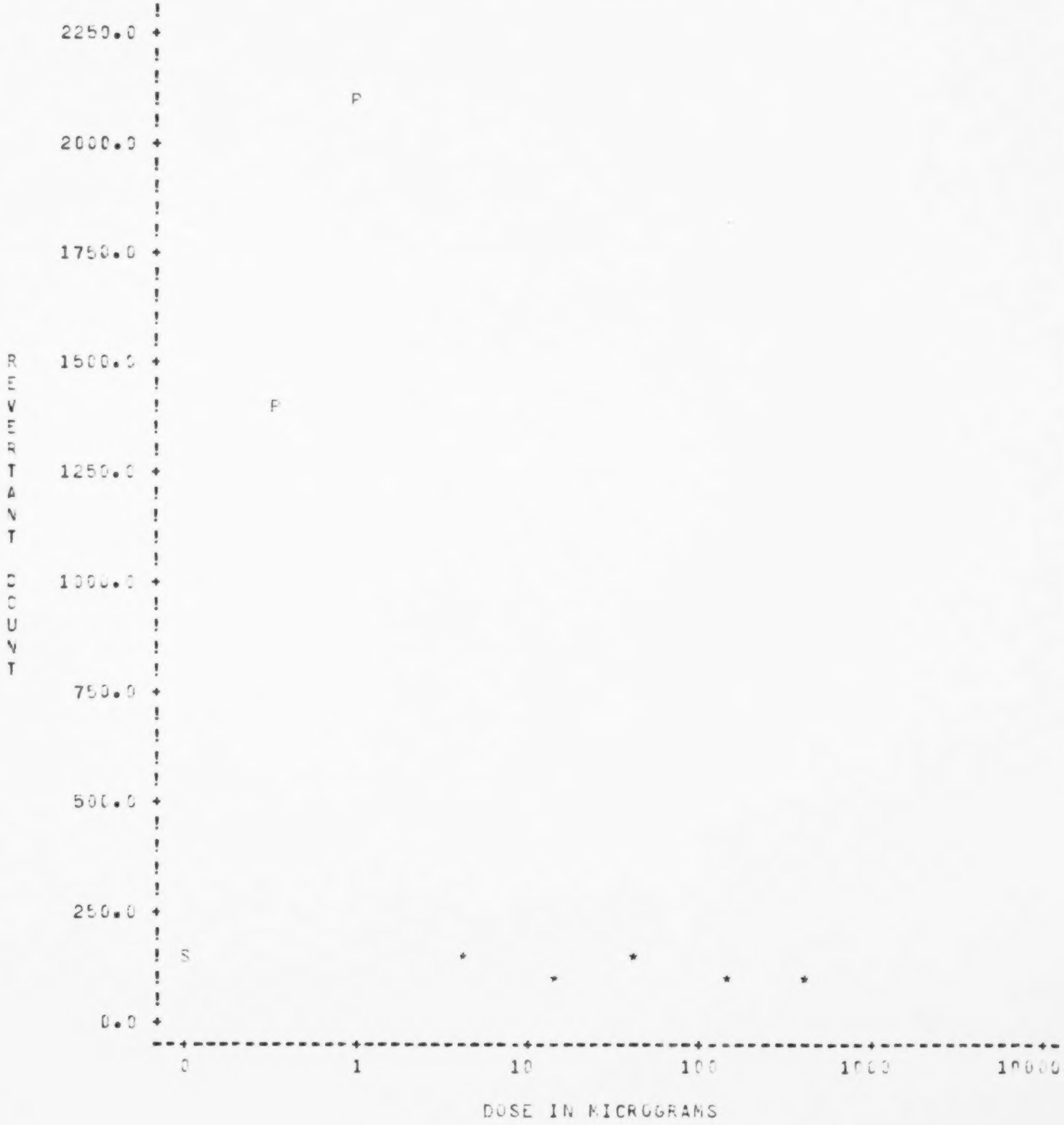
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=PP   STRAIN=100   DATE=042183   ACTIV=     ACT%=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
 CON=191482   CHEM=PP   STRAIN=100   DATE=042183   ACTIV=CSD002   ACTX=

               PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



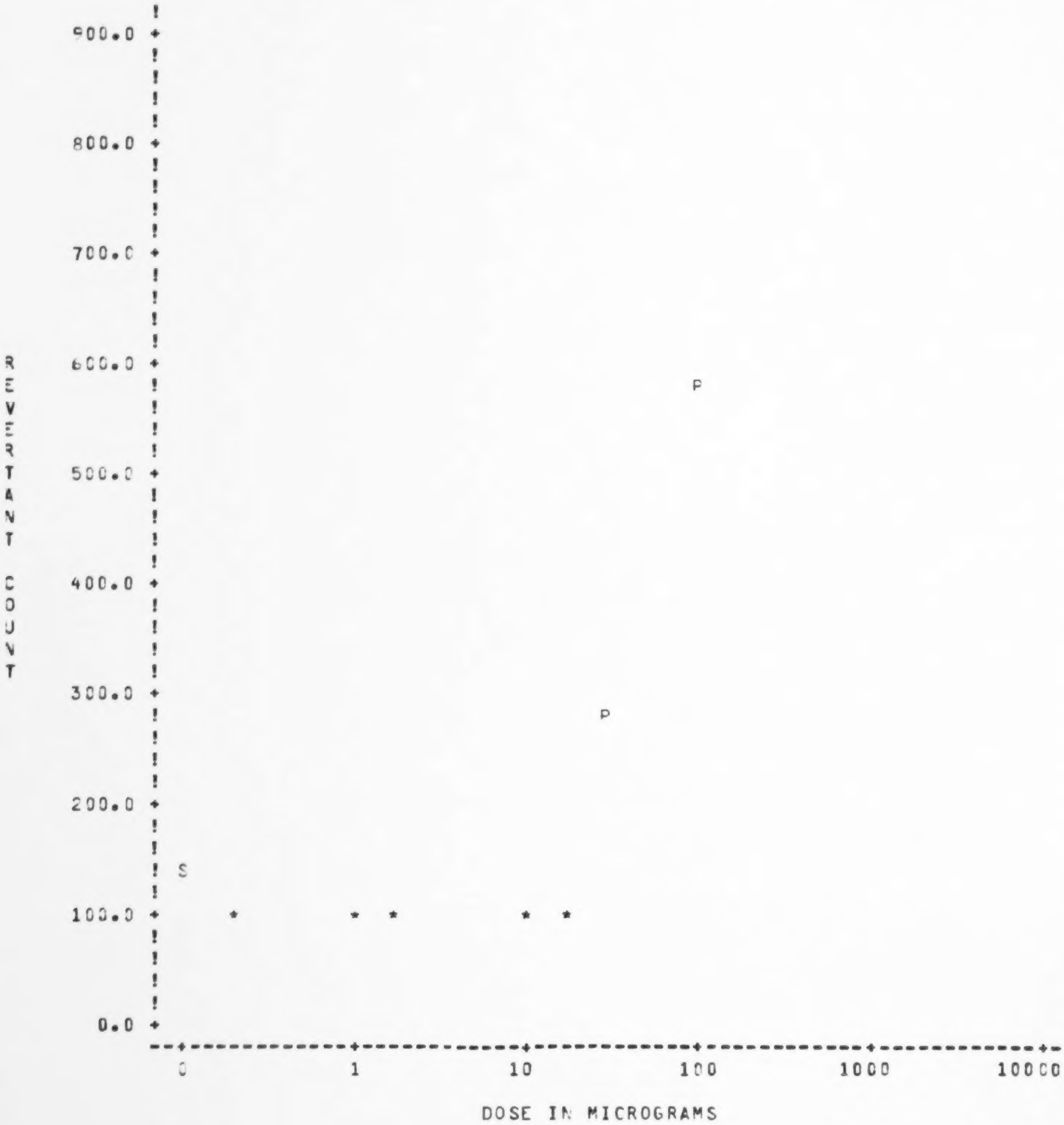
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=PP   STRAIN=100   DATE=042183   ACTIV=HEPAC1   ACTX=

            PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF AC - TA97

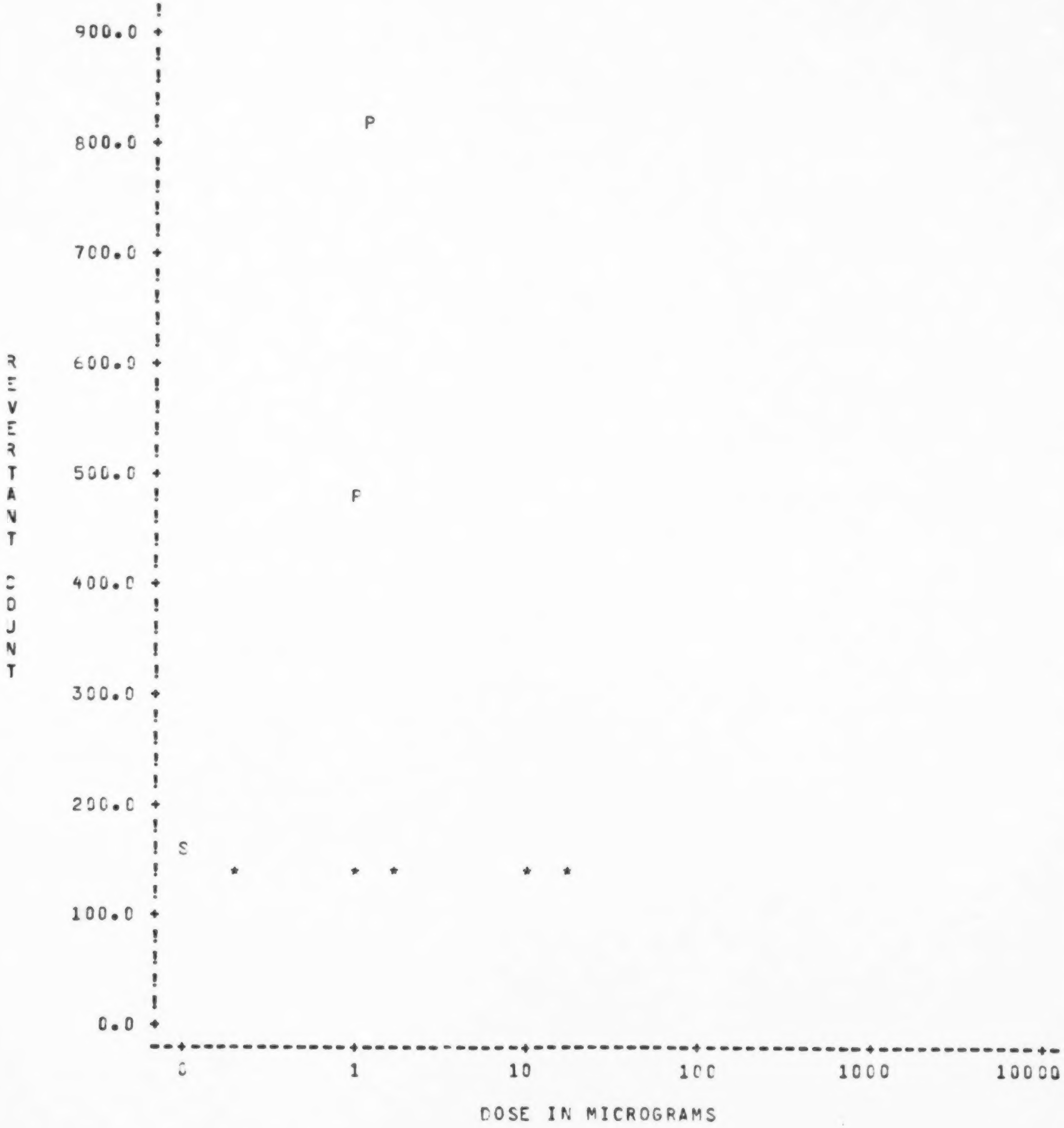
```
M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042783     CHEMICAL: AC            ACTIVATION:
TEST TYPE: 05        STRAIN: TA97            BATCH: D263
DILUTION=   :        PLATED=                 COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00     133       151       142      142.0       9.0    A    1.0
 P1 02    50.00     318       271       264      284.3      29.4    A    2.0
 P2 02   100.00     705       549       501      585.0     106.7    A    4.1
           0.30      96       111        84       97.0      13.5         0.7
           1.00     106       121        92      106.3      14.5         0.7
           3.00     126       106        87      106.3      19.5         0.7
          10.00      99        80        91       90.0       9.5         0.6
          31.00      79        97       129      101.7      25.3         0.7

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042783     CHEMICAL: AC            ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97            BATCH: D263
DILUTION=  1: 20     PLATED= 100             COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00     155       185       162      167.3      15.7    A    1.0
 P1 04     1.00     572       406       460      479.3      84.7    A    2.9
 P2 04     2.00     840       865       763      822.7      53.2    A    4.9
           0.30     139       125       145      136.3      10.3         0.8
           1.00     141       131       134      135.3       5.1         0.8
           3.00     162       114       158      144.7      26.6         0.9
          10.00     127       152       136      138.3      12.7         0.8
          31.00     154       117       123      131.3      19.9         0.8

M U T A G E N I C I T Y                      CONTRACT NO.: 191482
EXP DATE: 042783     CHEMICAL: AC            ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97            BATCH: D263
DILUTION=  1: 20     PLATED= 100             COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV   G/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00     183       198       171      184.0      13.5    A    1.0
 P1 04     0.50     731       678       644      684.3      43.8    A    3.7
 P2 04     1.00    1027       853       761      880.3     135.1    A    4.8
           0.30     137       132       139      136.0       3.6         0.7
           1.00     169       119       161      149.7      26.9         0.8
           3.00      86       129       155      123.3      34.8         0.7
          10.00     124       121       120      121.7       2.1         0.7
          31.00     140       118       117      125.0      13.0         0.7
```

```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=151482   CHEM=AC   STRAIN=97   DATE=042783   ACTIV=     ACTX=05

PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```

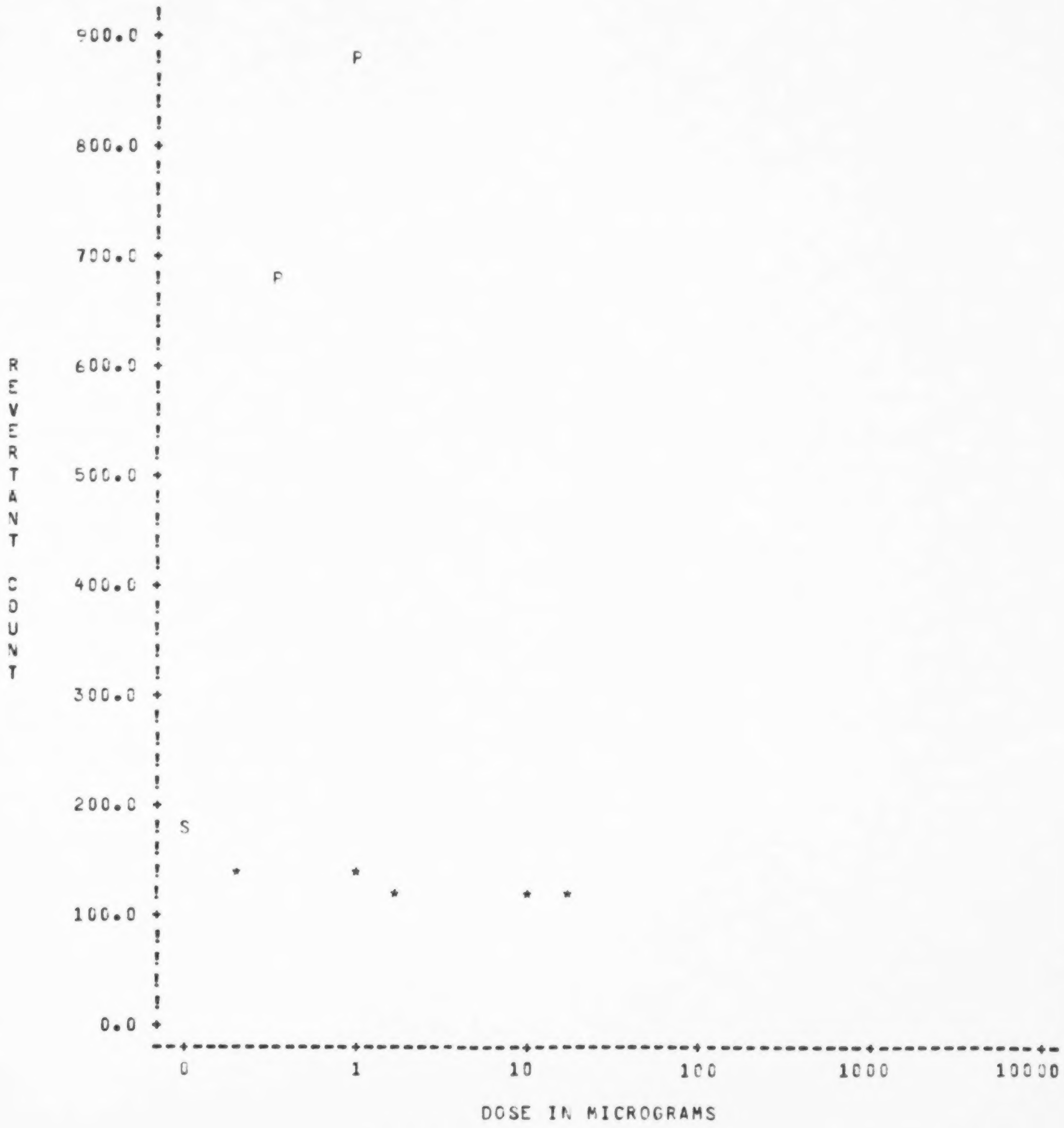


S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482 CHEM=AC STRAIN=97 DATE=042783 ACTIV=CSD002 ACT%=05

PLOT OF AVGCOUNT*DOSE SYMBOL IS VALUE OF SPIND



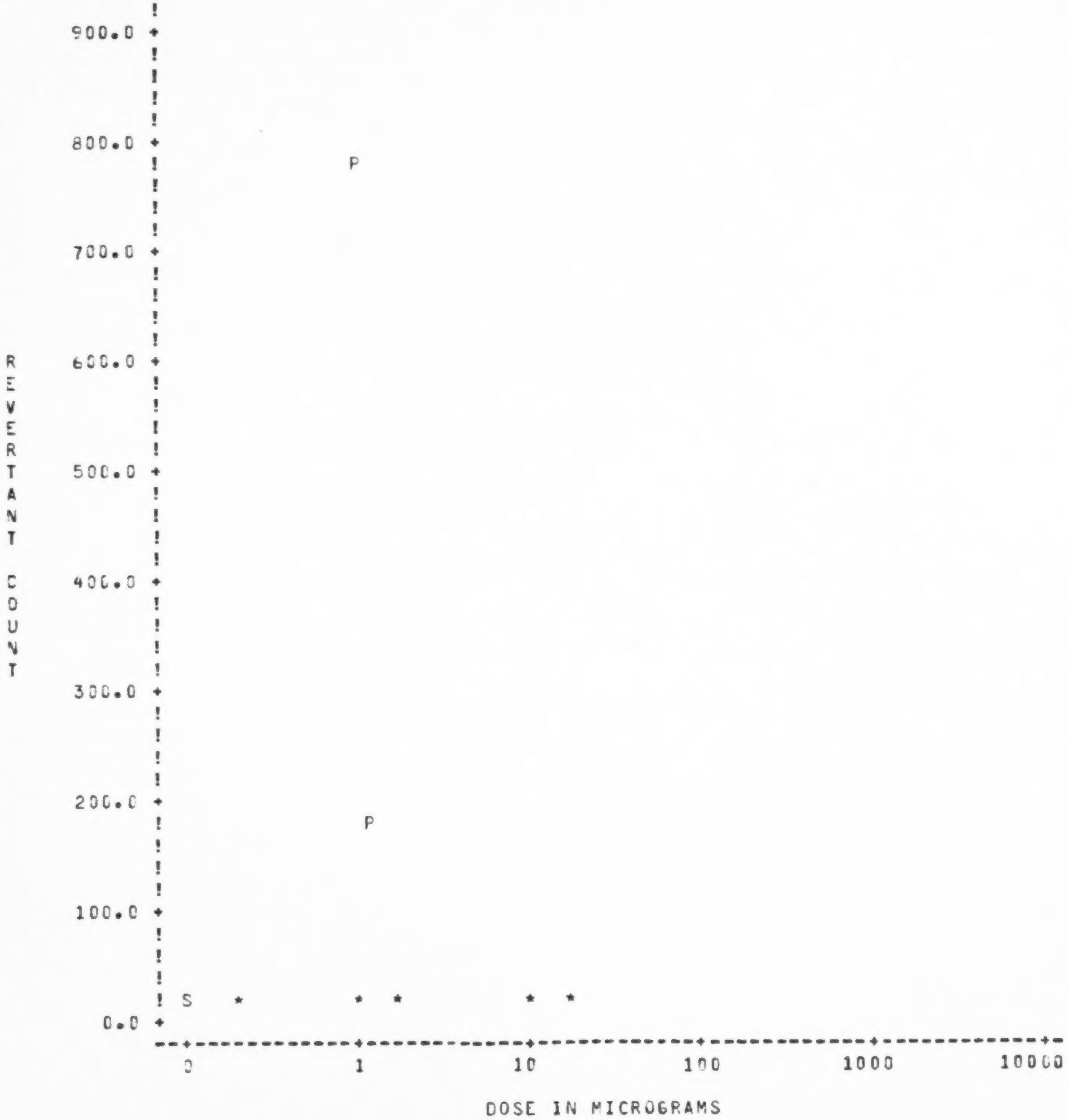
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=AC   STRAIN=97   DATE=042783   ACTIV=HEPA01   ACT%=05

          PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



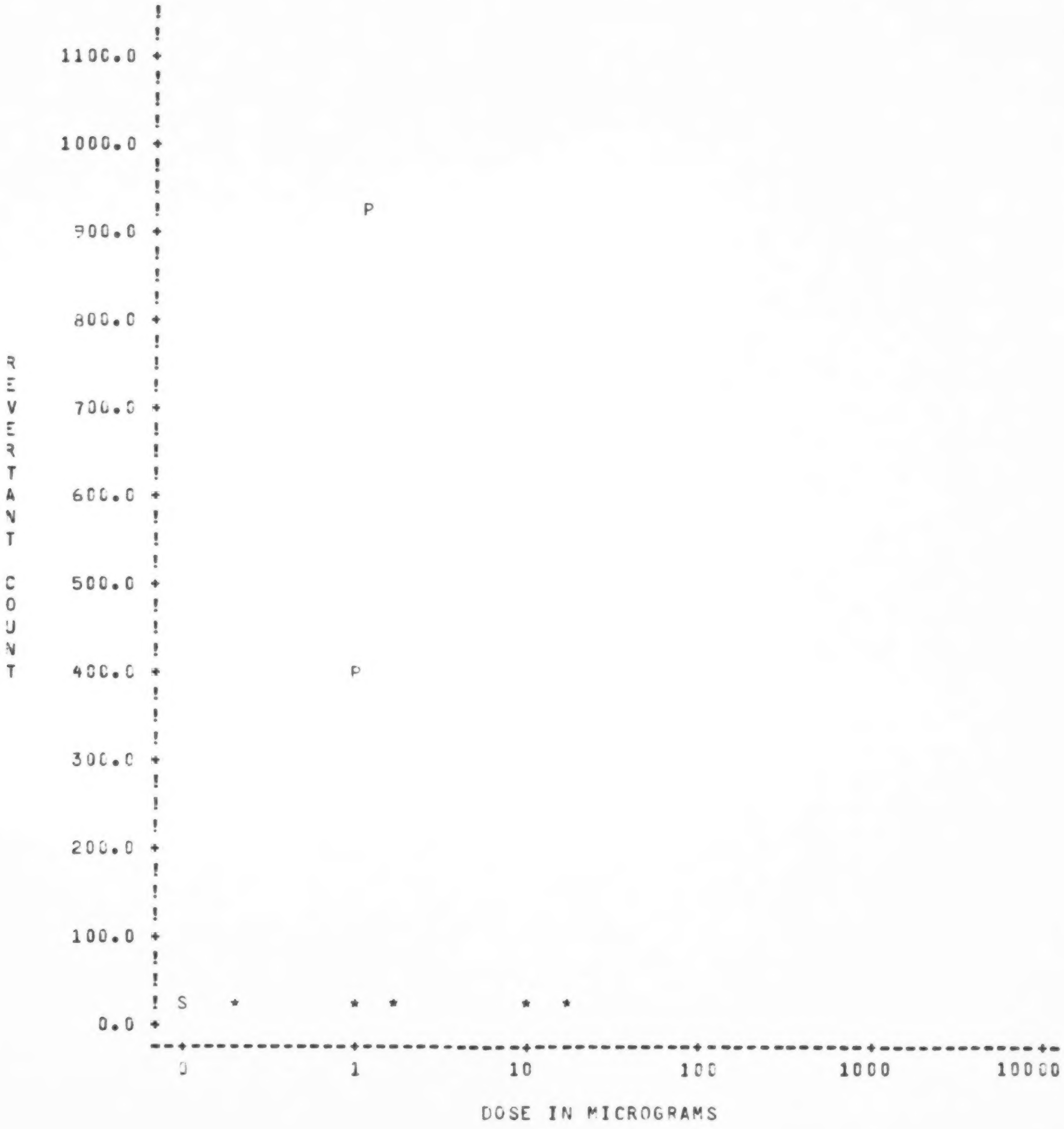
MUTAGENICITY OF AC - TA98

```
M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: AC            ACTIVATION:
TEST TYPE: 05       STRAIN: TA98            BATCH: D263
DILUTION=   :       PLATED=                 COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00      22        33        22        25.7      6.4     A   1.0
 P1 03     1.00     667       774       883       774.7    108.0     A  30.1
 P2 03     2.00     186       149       175       170.0     19.0     A   6.6
           0.30      19        22        23        21.3      2.1         0.8
           1.00      37        26        20        27.7      8.6         1.1
           3.00      18        14        20        17.3      3.1         0.7
          10.00      37        26        20        27.7      8.6         1.1
          31.00      23        18        29        23.3      5.5         0.9

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: AC            ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98            BATCH: D263
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00      25        42        36        34.3      8.6     A   1.0
 P1 04     1.00     429       399       387       405.0     21.6     A  11.8
 P2 04     2.00     959      1024       808       930.3    110.8     A  27.1
           0.30      26        43        19        29.3     12.3         0.9
           1.00      25        25        31        27.0      3.5         0.8
           3.00      23        19        28        23.3      4.5         0.7
          10.00      34        30        24        29.3      5.0         0.9
          31.00      33        39        32        34.7      3.8         1.0

M U T A G E N I C I T Y                       CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: AC            ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98            BATCH: D263
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  G/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00      37        25        53        38.3     14.0     A   1.0
 P1 04     0.50     711       809       754       758.0     49.1     A  19.8
 P2 04     1.00    1094      1303      1082      1159.7    124.3     A  30.3
           0.30      33        38        37        36.0      2.6         0.9
           1.00      37        26        32        31.7      5.5         0.8
           3.00      40        29        22        30.3      9.1         0.8
          10.00      23        18        29        23.3      5.5         0.6
          31.00      29        28        30        29.0      1.0         0.8
```

```
S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=AC   STRAIN=98   DATE=042783   ACTIV=    ACT%=05

PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=AC   STRAIN=98   DATE=042783   ACTIV=CSD002   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

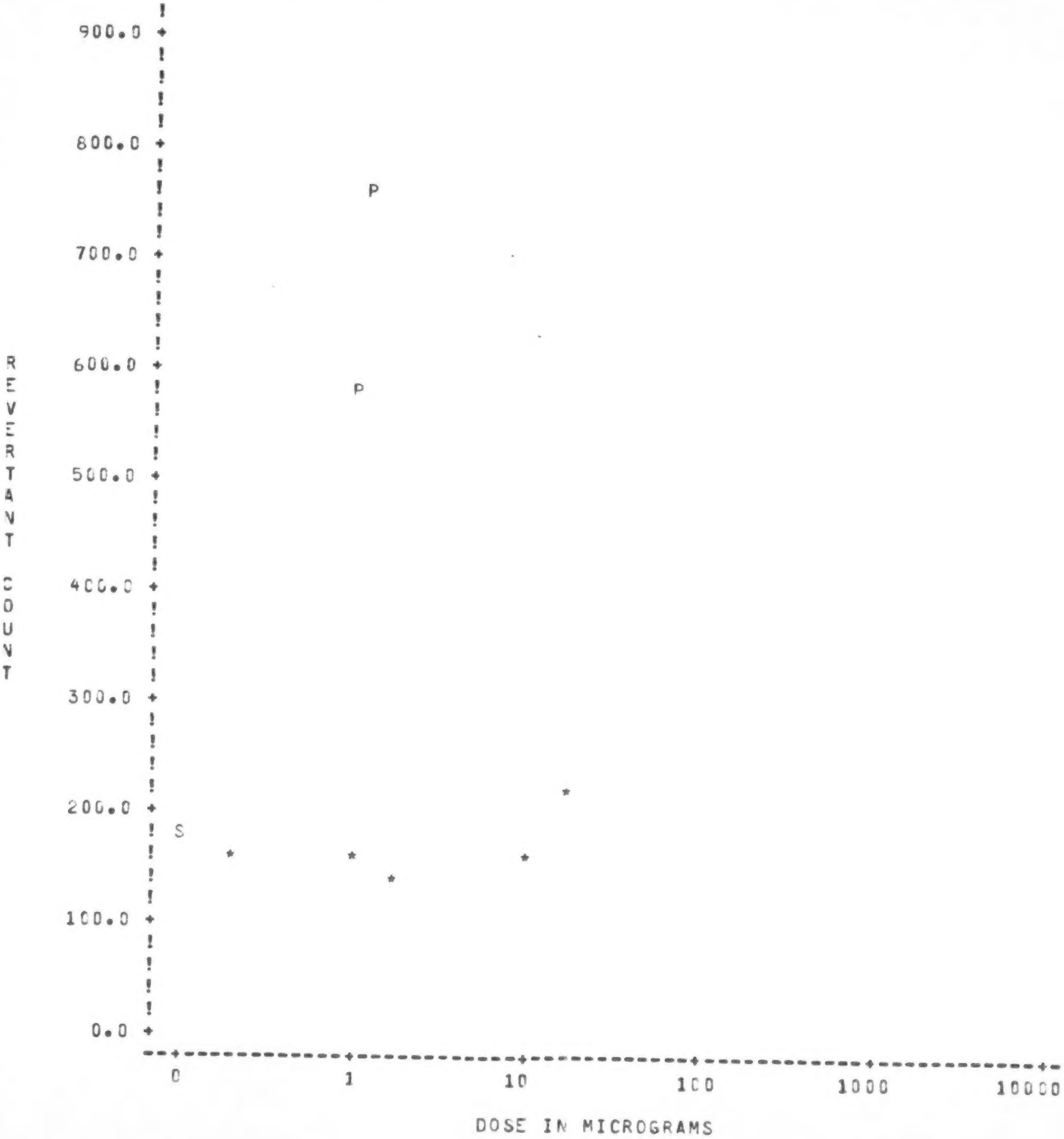


```
           S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
    CON=191482   CHEM=AC   STRAIN=98   DATE=042783   ACTIV=HEPA01   ACT%=05

                  PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND

           !
    1500.0 +
           !
           !
    1400.0 +
           !
           !
    1300.0 +
           !
           !
    1200.0 +
           !             P
           !
    1100.0 +
           !
           !
R   1000.0 +
E          !
V          !
E    900.0 +
R          !
T          !
A    800.0 +
N          !       P
T          !
     700.0 +
C          !
O          !
U    600.0 +
N          !
T          !
     500.0 +
           !
           !
     400.0 +
           !
           !
     300.0 +
           !
           !
     200.0 +
           !
           !
     100.0 +
           !
           ! S   *       *  *        *  *
       0.0 +
           --+-----------+-----------+-----------+-----------+-----------+-
             0           1          10          100         1000       10000

                                  DOSE IN MICROGRAMS
```

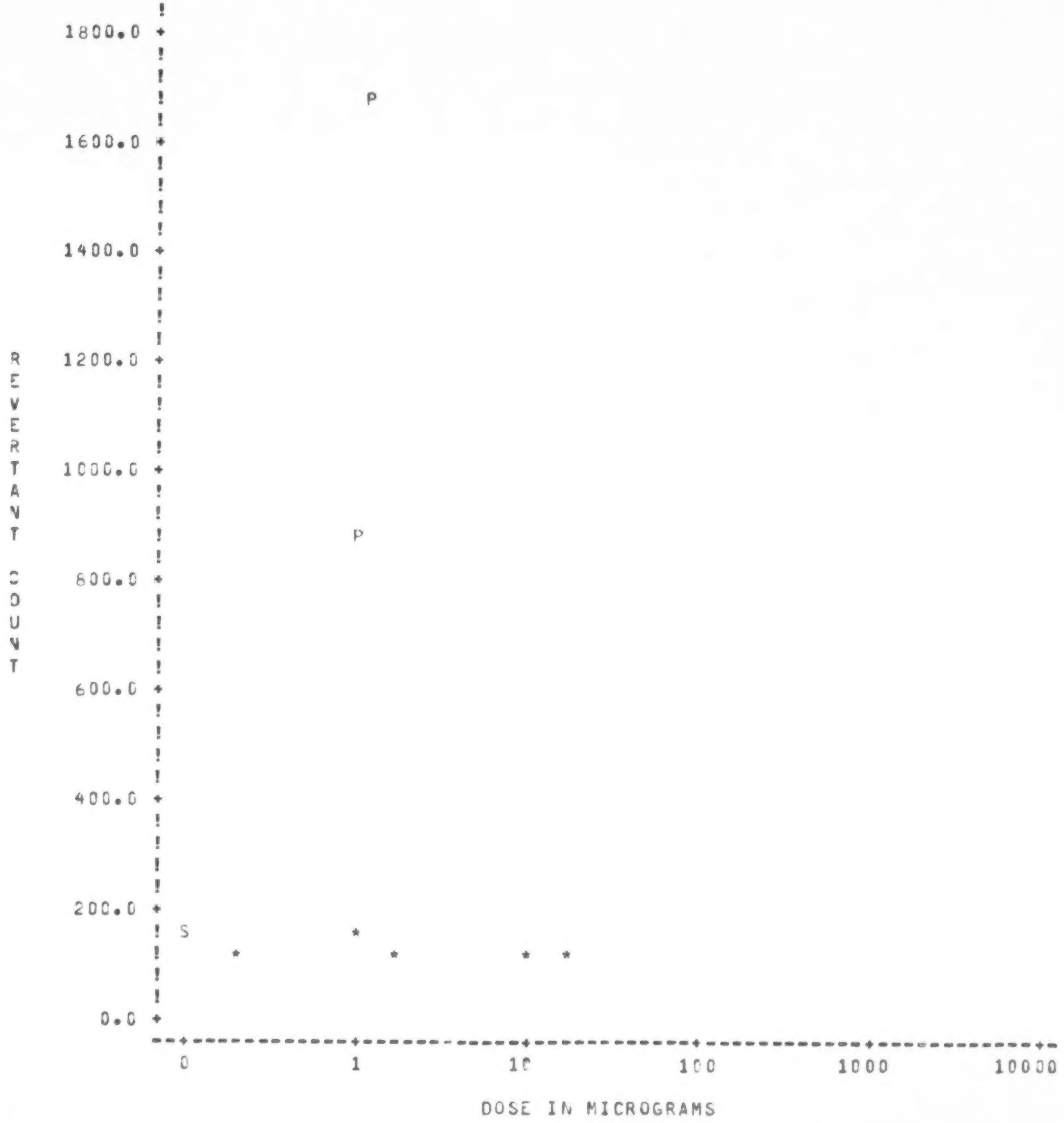
MUTAGENICITY OF AC - TA100

```
M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: AC               ACTIVATION:
TEST TYPE: 05       STRAIN: TA100              BATCH: D263
DILUTION=   :       PLATED=                    COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00     178       197       179      184.7      10.7    A   1.0
 P1 01     1.00     585       548       598      577.0      25.9    A   3.1
 P2 01     2.00     769       813       674      752.0      71.0    A   4.1
           0.30     154       139       170      154.3      15.5        0.8
           1.00     167       148       149      154.7      10.7        0.8
           3.00     144       155       137      145.3       9.1        0.8
          10.00     150       166       163      166.3      18.2        0.9
          31.00     192       249       240      227.0      30.6        1.2

M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: AC               ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100              BATCH: D263
DILUTION=  1: 20    PLATED= 100                COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00     164       181       177      174.0       8.9    A   1.0
 P1 04     1.00     886       810       898      864.7      47.7    A   5.0
 P2 04     2.00    1603      1759      1679     1680.3      78.0    A   9.7
           0.30     127       131       134      130.7       3.5        0.8
           1.00     124       171       178      157.7      29.4        0.9
           3.00      97       142       118      119.0      22.5        0.7
          10.00     122       129       131      127.3       4.7        0.7
          31.00     128       133       127      129.3       3.2        0.7

M U T A G E N I C I T Y                         CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: AC               ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100              BATCH: D263
DILUTION=  1: 20    PLATED= 100                COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 57     0.00     216       190       193      199.7      14.2    A   1.0
 P1 04     0.50    1016       876      1101      997.7     113.6    A   5.0
 P2 04     1.00    1886      1765      1773     1808.0      67.7    A   9.1
           0.30     159       185       159      167.7      15.0        0.8
           1.00     132       196       153      160.3      32.6        0.8
           3.00     153       146       148      149.0       3.6        0.7
          10.00     132       156       156      148.0      13.9        0.7
          31.00     148       164       122      144.7      21.2        0.7
```

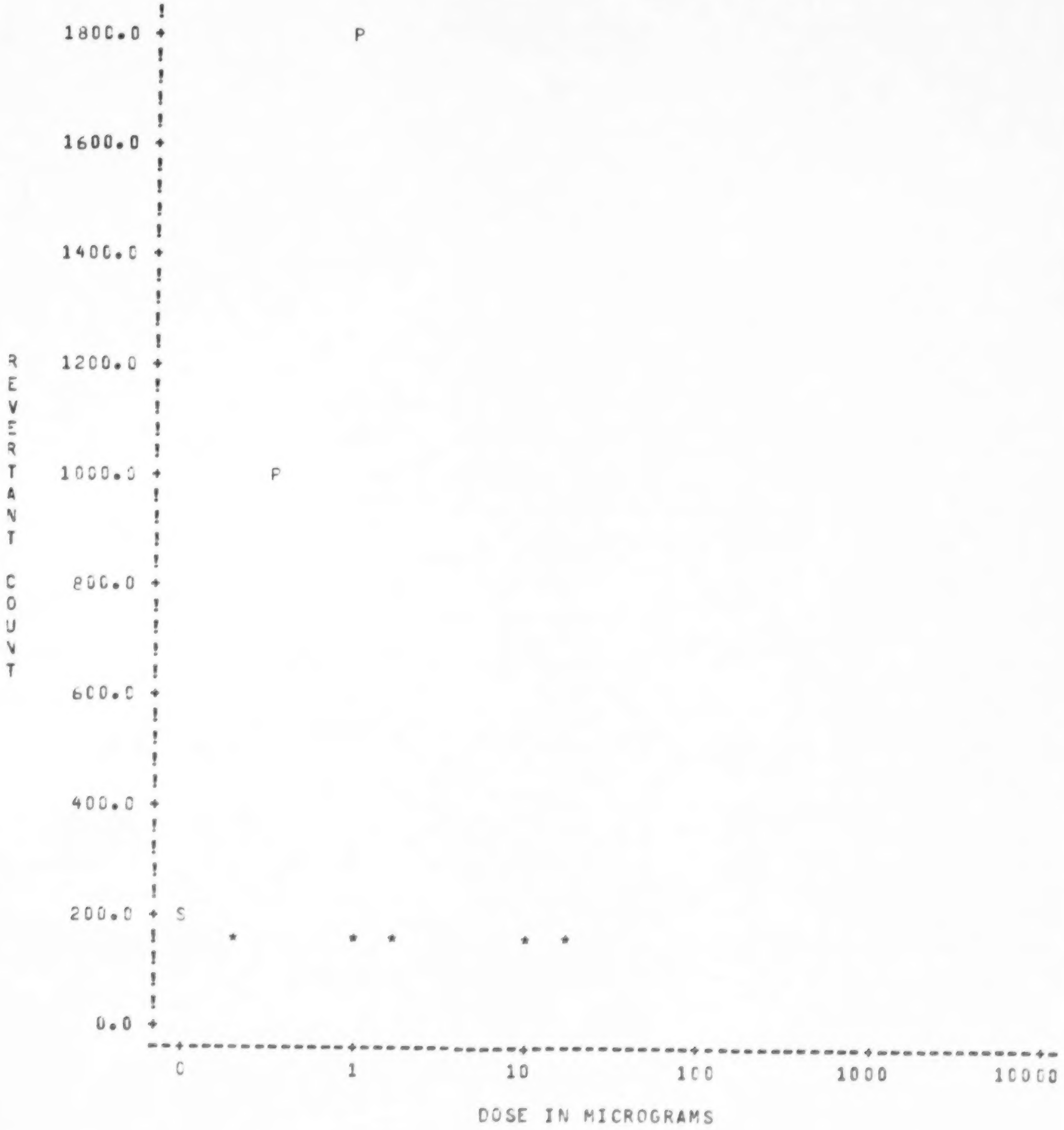
```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=AC   STRAIN=100   DATE=042783   ACTIV=     ACT%=05

          PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



```
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=AC   STRAIN=100   DATE=042783   ACTIV=CSD002   ACT%=05

          PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



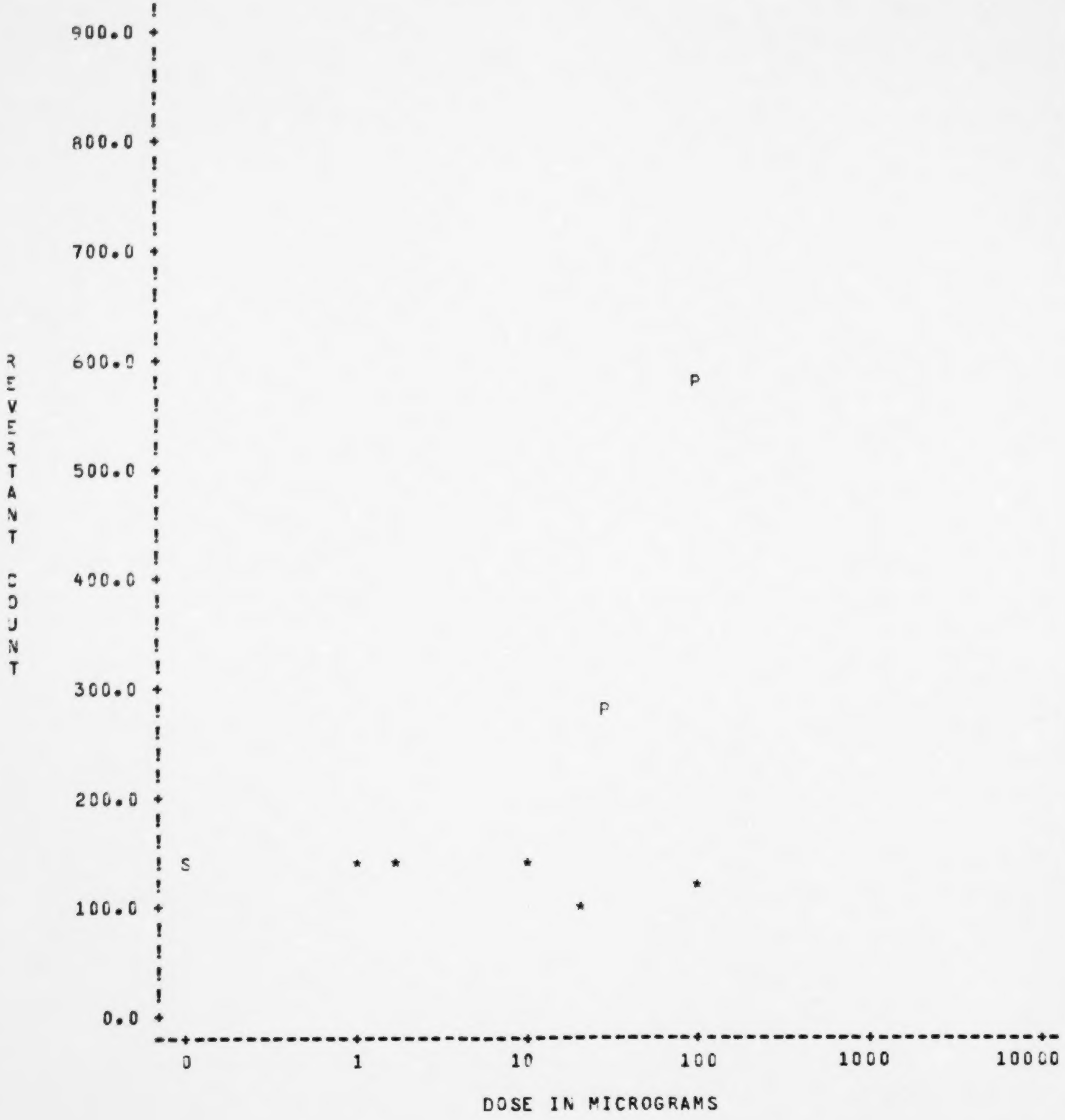
```
        S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=AC   STRAIN=100   DATE=042783   ACTIV=HEPA01   ACT%=05

                PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



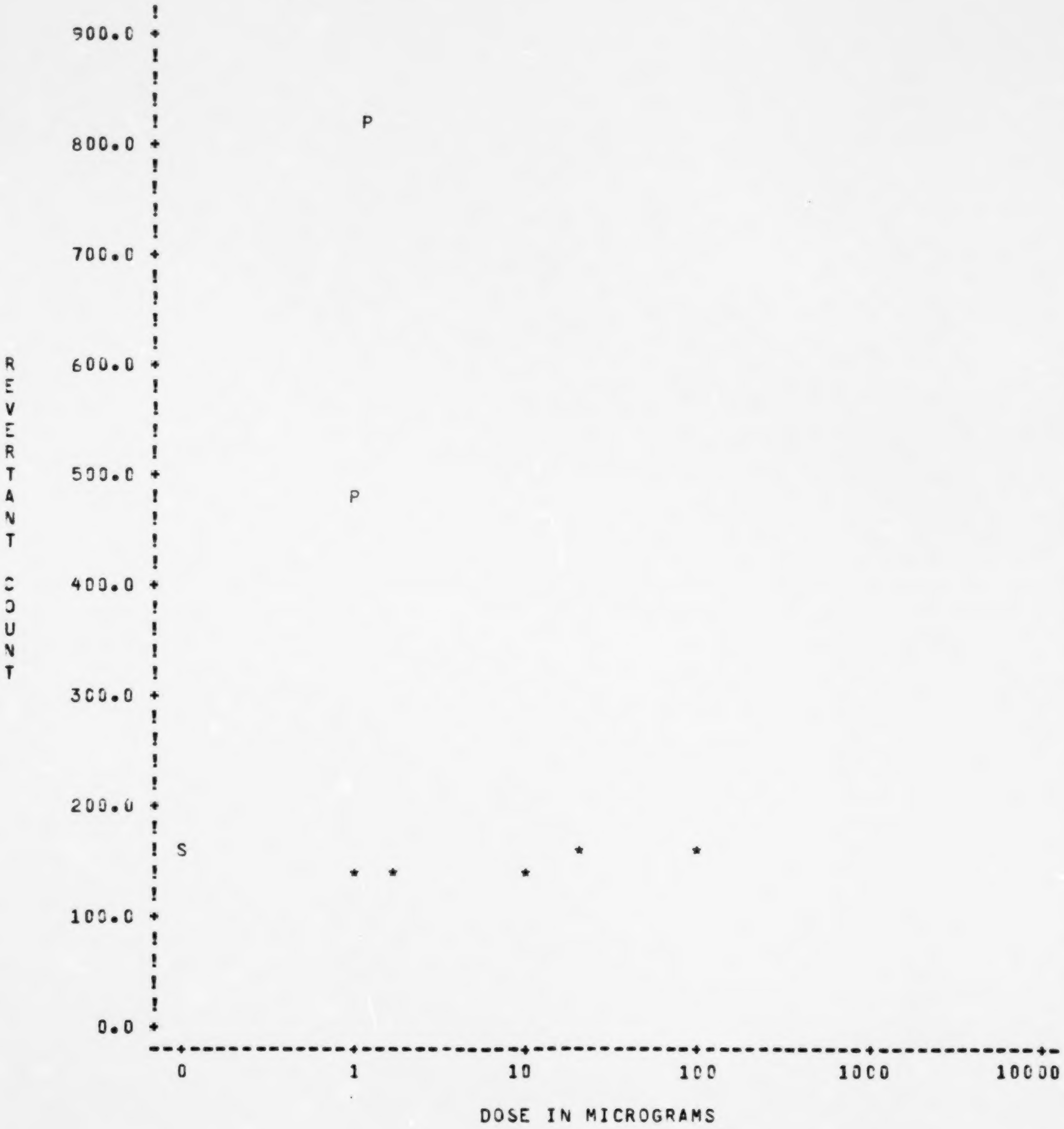
MUTAGENICITY OF EO - TA97

```
M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 042783     CHEMICAL: EO         ACTIVATION:
TEST TYPE: 05        STRAIN: TA97         BATCH: D263
DILUTION=   :        PLATED=              COLONIES=
MIXTURE=             TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG  COUNT    COUNT

 S1 55     0.00    127       150       169      148.7     21.0    A    1.0
 P1 02    50.00    318       271       264      284.3     29.4   NA    1.9
 P2 02   100.00    705       549       501      585.0    106.7    A    3.9
           1.00    121       145       154      140.0     17.1         0.9
           3.00    136       124       164      141.3     20.5         1.0
          11.00    135       150       134      139.7      9.0         0.9
          37.00     98        97       106      100.3      4.9         0.7
         111.00    118       124       116      119.3      4.2         0.8

M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 042783     CHEMICAL: EO         ACTIVATION: CSD002
TEST TYPE: 05        STRAIN: TA97         BATCH: D263
DILUTION=  1: 20     PLATED= 100          COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG  COUNT    COUNT

 S1 55     0.00    136       163       170      156.3     18.0    A    1.0
 P1 04     1.00    572       406       460      479.3     84.7    A    3.1
 P2 04     2.00    840       865       763      822.7     53.2    A    5.3
           1.00    142       139       162      147.7     12.5         0.9
           3.00    112       157       176      148.3     32.9         0.9
          11.00    132       158       155      148.3     14.2         0.9
          37.00    169       155       149      157.7     10.3         1.0
         111.00    164       163       168      165.0      2.6         1.1

M U T A G E N I C I T Y                   CONTRACT NO.: 191482
EXP DATE: 042783     CHEMICAL: EO         ACTIVATION: HEPA01
TEST TYPE: 05        STRAIN: TA97         BATCH: D263
DILUTION=  1: 20     PLATED= 100          COLONIES=
MIXTURE= 500         TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE  STD DEV  Q/C   MR    MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG  COUNT    COUNT

 S1 55     0.00    158       143       149      150.0      7.5    A    1.0
 P1 04     0.50    731       678       644      684.3     43.8    A    4.6
 P2 04     1.00   1027       853       761      880.3    135.1    A    5.9
           1.00    154       151       185      163.3     18.8         1.1
           3.00    151       160       167      159.3      8.0         1.1
          11.00    153       146       177      158.7     16.3         1.1
          37.00    147       157       173      159.0     13.1         1.1
         111.00    141       167       142      150.0     14.7         1.0
```

```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EO   STRAIN=97   DATE=042783   ACTIV=    ACTX=05

          PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```

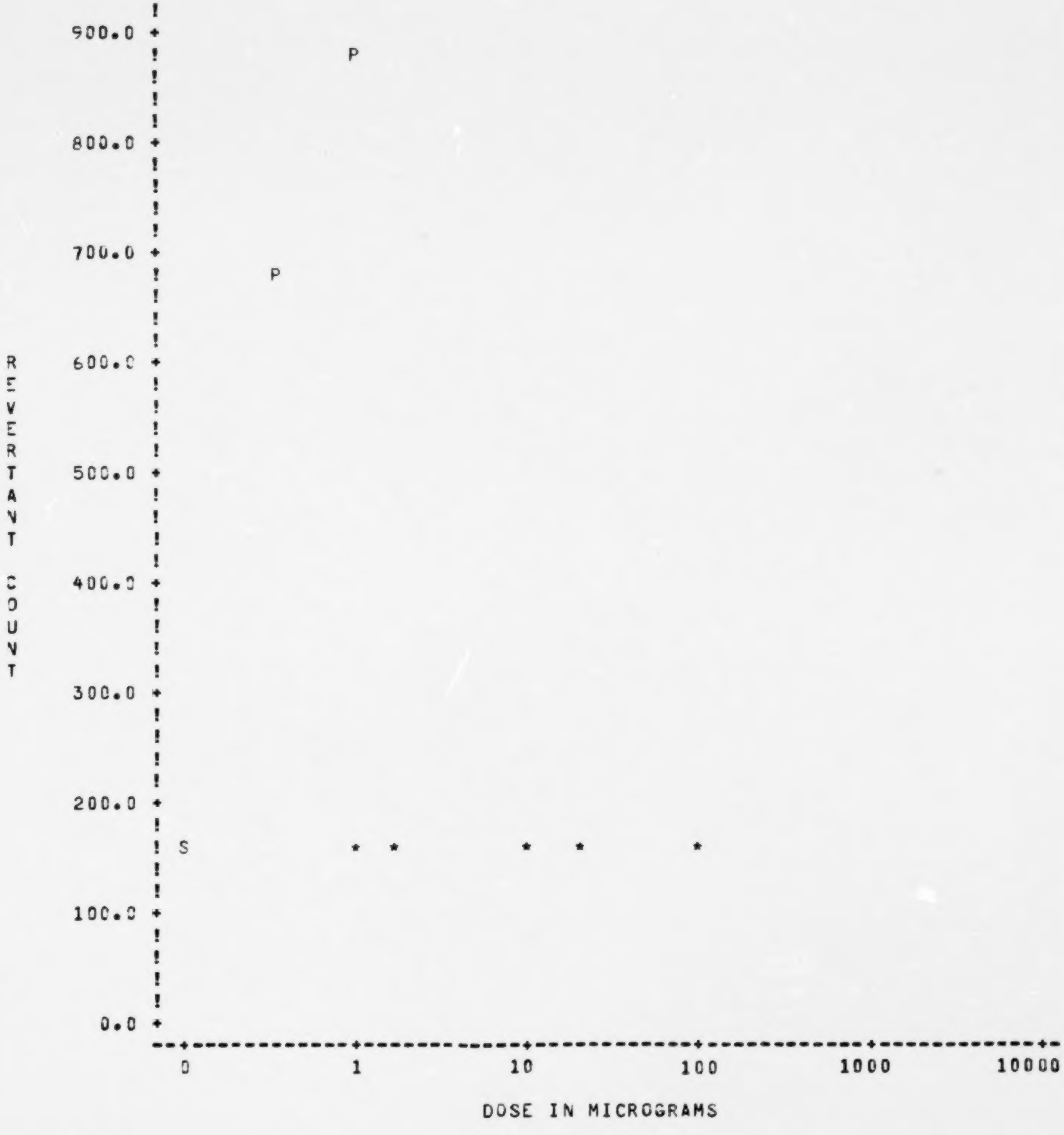


```
          S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EO   STRAIN=97   DATE=042783   ACTIV=CSD002   ACTX=05

                 PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482 CHEM=EO STRAIN=97 DATE=042783 ACTIV=HEPA01 ACT%=05

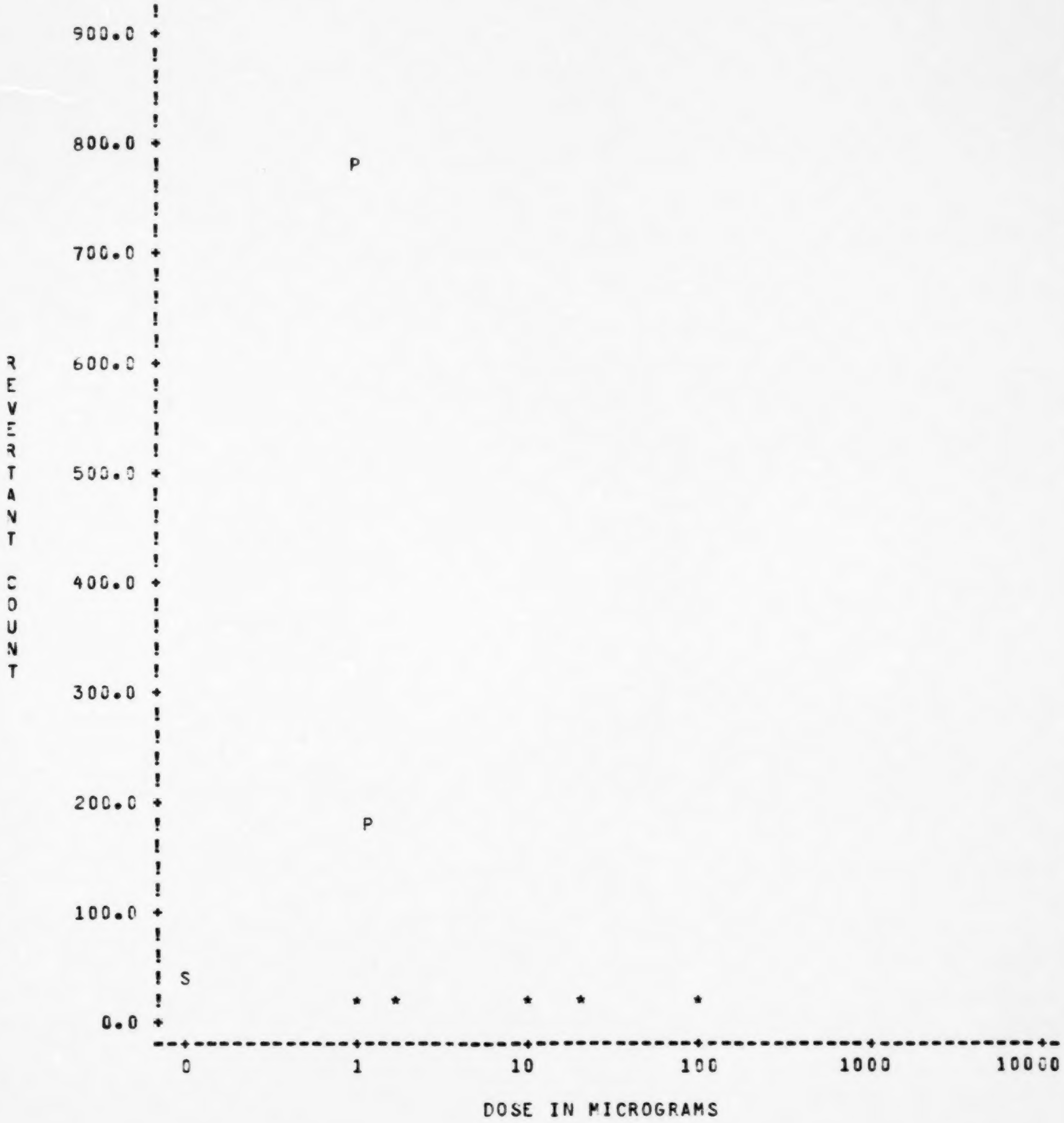
PLOT OF AVGCOUNT*DOSE SYMBOL IS VALUE OF SPIND



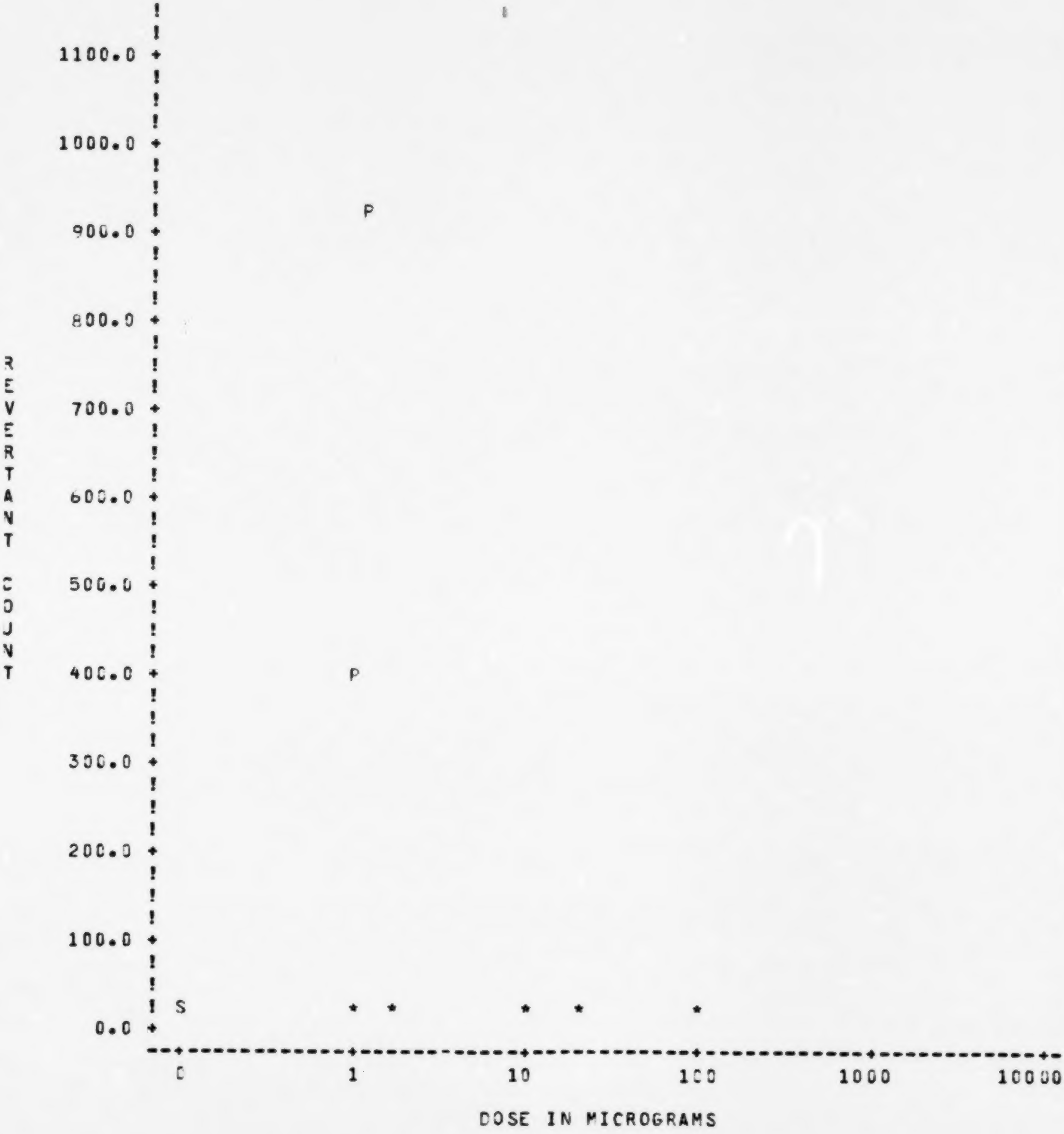
MUTAGENICITY OF EO - TA98

```
M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: EO            ACTIVATION:
TEST TYPE: 05       STRAIN: TA98            BATCH: D263
DILUTION=   :       PLATED=                 COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00     44        29        30       34.3      8.4    A   1.0
 P1 03     1.00    667       774       883      774.7    108.0    A  22.6
 P2 03     2.00    186       149       175      170.0     19.0    A   5.0
           1.00     19        29        27       25.0      5.3        0.7
           3.00     17        13        23       17.7      5.0        0.5
          11.00     15        25        23       21.0      5.3        0.6
          37.00     32        21        17       23.3      7.8        0.7
         111.00     15        33        19       22.3      9.5        0.7

M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: EO            ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA98            BATCH: D263
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00     32        32        33       32.3      0.6    A   1.0
 P1 04     1.00    429       399       387      405.0     21.6    A  12.5
 P2 04     2.00    959      1024       808      930.3    110.8    A  28.8
           1.00     30        40        31       33.7      5.5        1.0
           3.00     33        39        29       33.7      5.0        1.0
          11.00     30        25        38       31.0      6.6        1.0
          37.00     48        24        24       32.0     13.9        1.0
         111.00     38        28        34       33.3      5.0        1.0

M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: EO            ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA98            BATCH: D263
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE    PLATE A:  PLATE B:  PLATE C:  AVERAGE   STD DEV  Q/C  MR   MEC
POSITIVE  LEVEL   COUNT BG  COUNT BG  COUNT BG   COUNT     COUNT

 S1 55     0.00     46        16        55       39.0     20.4    A   1.0
 P1 04     0.50    711       809       754      758.0     49.1    A  19.4
 P2 04     1.00   1094      1303      1082     1159.7    124.3    A  29.7
           1.00     41        38        39       39.3      1.5        1.0
           3.00     37        42        30       36.3      6.0        0.9
          11.00     31        28        25       28.0      3.0        0.7
          37.00     32        34        30       32.0      2.0        0.8
         111.00     38        36        36       36.7      1.2        0.9
```

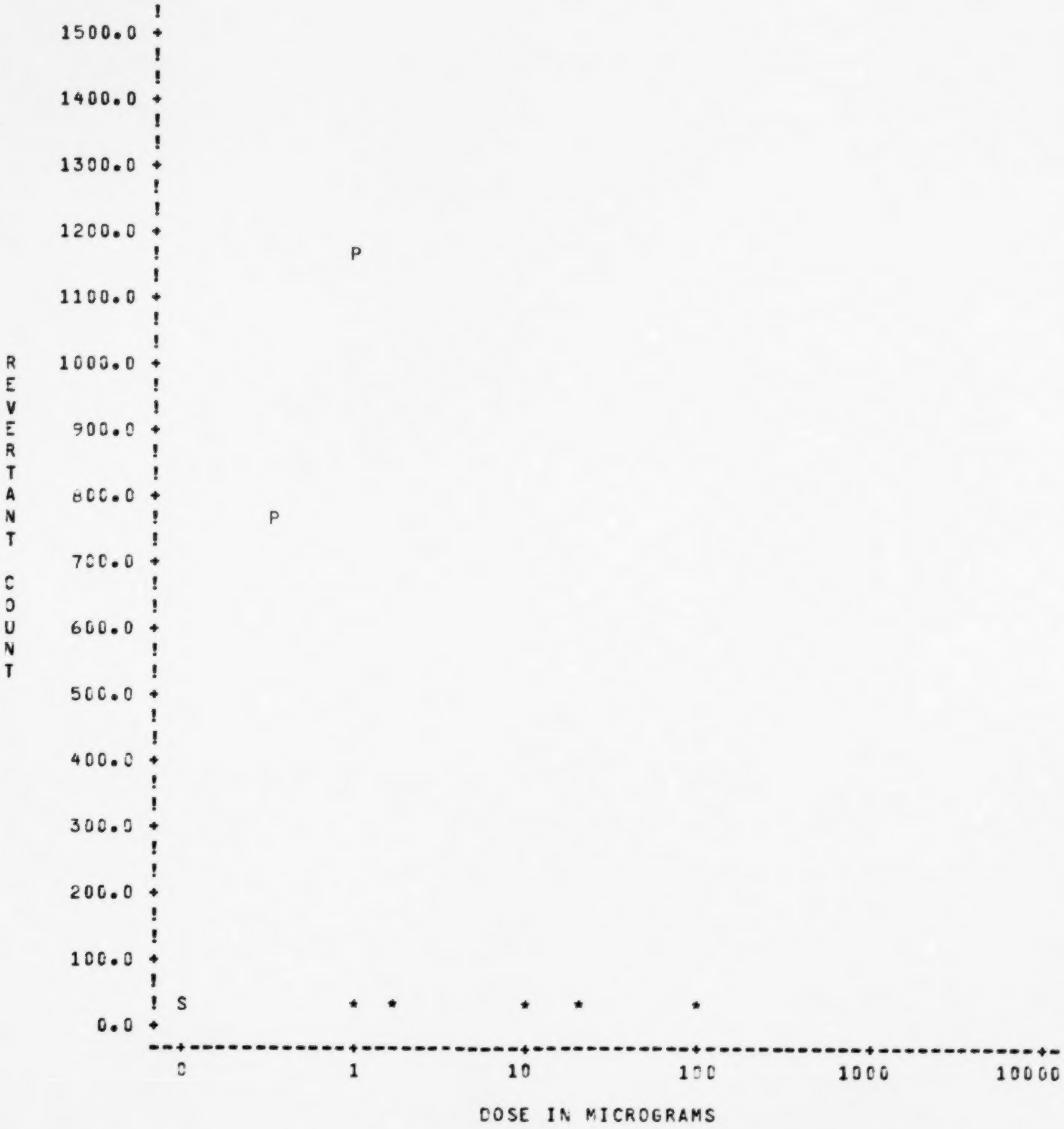
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482    CHEM=EO    STRAIN=98    DATE=042783    ACTIV=      ACT%=05

              PLOT OF AVGCOUNT*DOSE     SYMBOL IS VALUE OF SPIND
```



```
         S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EO   STRAIN=98   DATE=042783   ACTIV=CSD002   ACTX=05

              PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



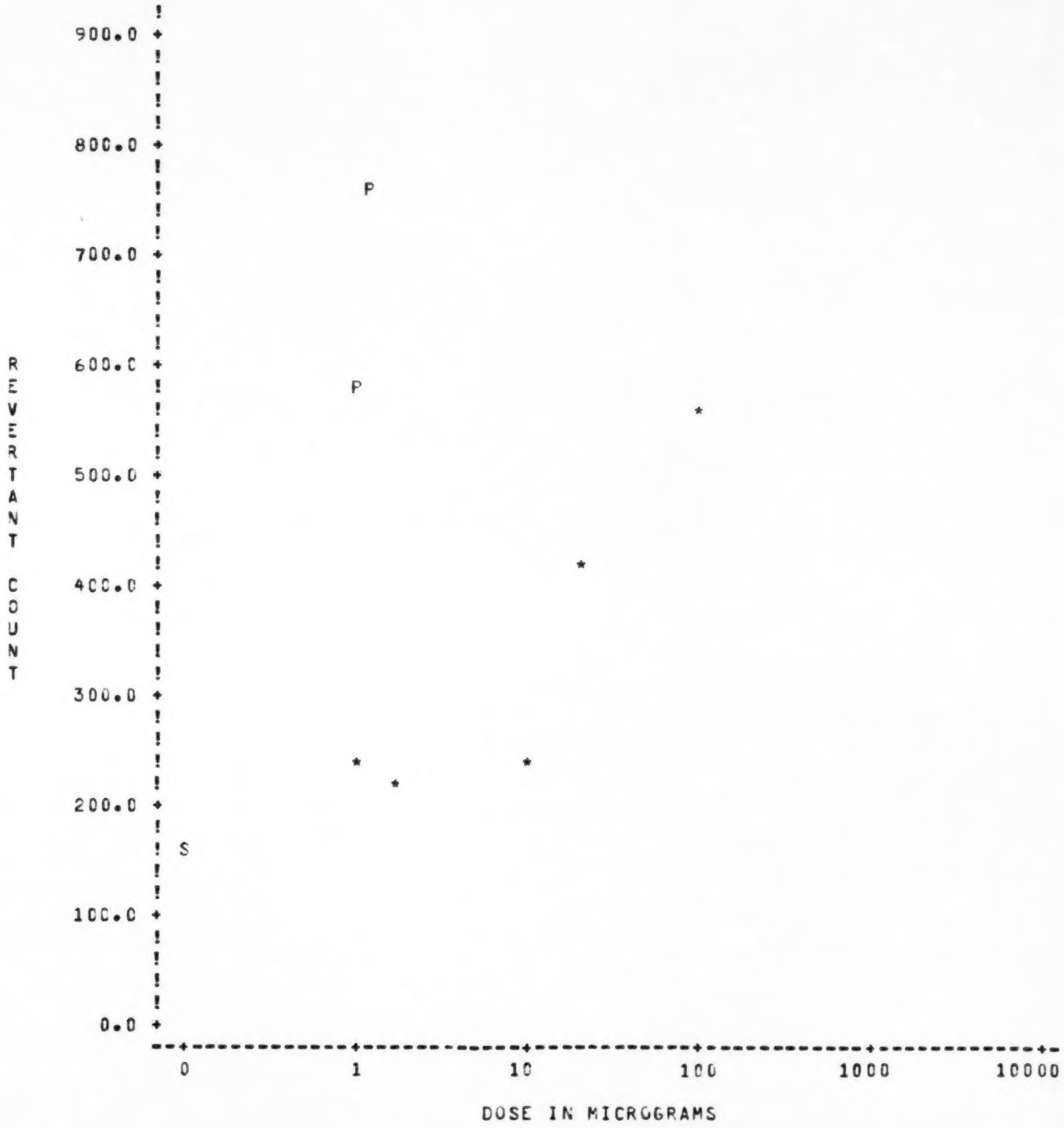
```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EO   STRAIN=98   DATE=042783   ACTIV=HEPA01   ACTX=05

             PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



MUTAGENICITY OF EO - TA100

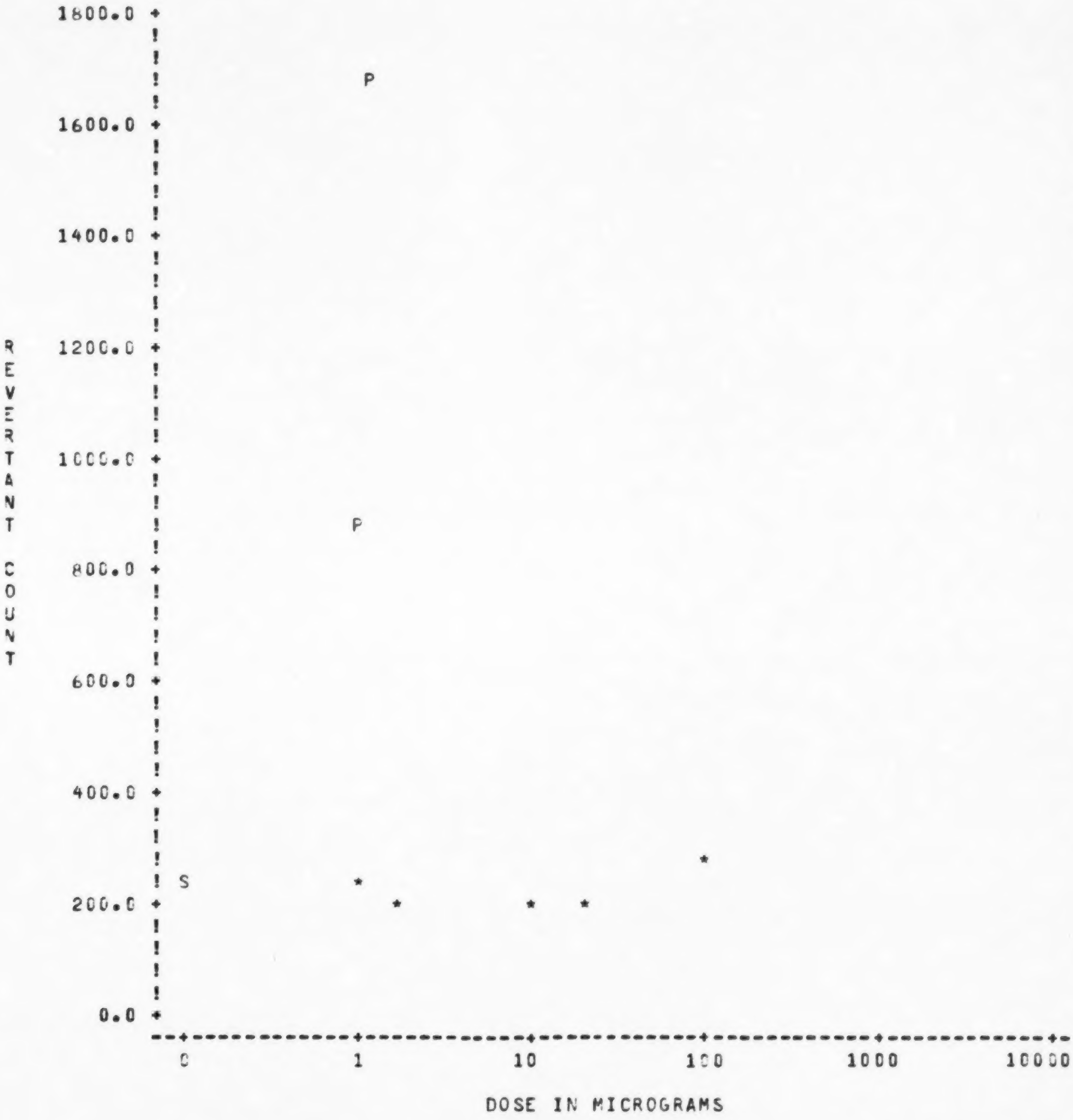
```
M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: EO            ACTIVATION:
TEST TYPE: 05       STRAIN: TA100           BATCH: D263
DILUTION=   :       PLATED=                 COLONIES=
MIXTURE=            TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 55      0.00     157        220        110       162.3      55.2     A    1.0
 P1 01      1.00     585        548        598       577.0      25.9     A    3.6
 P2 01      2.00     769        813        674       752.0      71.0     A    4.6
            1.00     234        268        247       249.7      17.2          1.5
            3.00     205        223        239       222.3      17.0          1.4
           11.00     252        247        243       247.3       4.5          1.5
           37.00     442        380        432       418.0      33.3          2.6     *
          111.00     551        590        566       569.0      19.7          3.5

M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: EO            ACTIVATION: CSD002
TEST TYPE: 05       STRAIN: TA100           BATCH: D263
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 55      0.00     152        220        369       247.0     111.0     NA   1.0
 P1 04      1.00     886        870        898       884.7      14.0     A    3.6
 P2 04      2.00    1603       1759       1679      1680.3      78.0     A    6.8
            1.00     246        281        183       236.7      49.7          1.0
            3.00     182        268        188       212.7      48.0          0.9
           11.00     185        180        184       183.0       2.6          0.7
           37.00     217        227        197       213.7      15.3          0.9
          111.00     302        285        203       263.3      52.9          1.1

M U T A G E N I C I T Y                     CONTRACT NO.: 191482
EXP DATE: 042783    CHEMICAL: EO            ACTIVATION: HEPA01
TEST TYPE: 05       STRAIN: TA100           BATCH: D263
DILUTION=  1: 20    PLATED= 100             COLONIES=
MIXTURE= 500        TECHNICIAN= LGM

SOLVENT/  DOSE     PLATE A:   PLATE B:   PLATE C:   AVERAGE   STD DEV   Q/C   MR    MEC
POSITIVE  LEVEL    COUNT BG   COUNT BG   COUNT BG    COUNT     COUNT

 S1 55      0.00     154        156        167       159.0       7.0     A    1.0
 P1 04      0.50    1016        876       1101       997.7     113.6     A    6.3
 P2 04      1.00    1886       1765       1773      1808.0      67.7     A   11.4
            1.00     297        186        165       216.0      70.9          1.4
            3.00     284        237        196       239.0      44.0          1.5
           11.00     324        295        264       294.3      30.0          1.9
           37.00     284        269        300       284.3      15.5          1.8
          111.00     291        413        357       353.7      61.1          2.2     *
```

```
     S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=E0   STRAIN=100   DATE=042783   ACTIV=    ACTX=05

          PLOT OF AVGCOUNT*DOSE    SYMBOL IS VALUE OF SPIND
```



S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482 CHEM=EO STRAIN=100 DATE=042783 ACTIV=CSD002 ACT%=05

PLOT OF AVGCOUNT*DOSE SYMBOL IS VALUE OF SPIND



```
      S=SOLVENT P=POSITIVE N=ANTHRAMINE W/O S9 *=TEST COMPOUND
CON=191482   CHEM=EO   STRAIN=100   DATE=042783   ACTIV=HEPA01   ACT%=05
```

PLOT OF AVGCOUNT*DOSE   SYMBOL IS VALUE OF SPIND